ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name:	**PeopleNet Connected Tablet**
Brand Name:	**PeopleNet**
Model No.:	**MS5**
Model Difference:	**N/A**
FCC ID:	**NKS-MS5**
Report No.:	**E2/2015/10035**
Issue Date:	**Mar. 11, 2015**
FCC Rule Part:	**§15.247, Cat: DTS**
Prepared for:	**PEOPLENET 4400 Baker Road, Minnetonka, MN 55343, USA**
Prepared by:	**SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333**

ilac-MRA TAF Testing Laboratory 0513	***Note:*** *This report shall not be reproduced except in full, without the written approval of SGS Taiwan Ltd. This document may be altered or revised by SGS Taiwan Ltd. personnel only, and shall be noted in the revision section of the document.*

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VERIFICATION OF COMPLIANCE

Applicant:	PEOPLENET 4400 Baker Road, Minnetonka, MN 55343, USA
Product Name:	PeopleNet Connected Tablet
Brand Name:	PeopleNet
Model No.:	MS5
Model Difference:	N/A
FCC ID:	NKS-MS5
File Number:	E2/2015/10035
Date of test:	Jan. 30, 2015 ~ Mar. 11, 2015
Date of EUT Received:	Jan. 30, 2015

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2014 the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Tin Lin	***Date***	Mar. 11, 2015
	Tin Lin / Engineer		
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	Allen Tsai / Engineer		
Approved By:	Jim Chang	***Date***	Mar. 11, 2015
	Jim Chang / Supervisor		

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00	Mar. 11, 2015	Initial creation of document

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name:	PeopleNet Connected Tablet	
Brand Name:	PeopleNet	
Model No.:	MS5	
Model difference:	By customer named	
Hardware Version:	N/A	
Software Version:	N/A	
Tablet Docking Station	Model No.: MS-57602, Supplier: MSI	
Power Cable	P/N: L016-0576, Supplier: ELECTRI-CORD MFG.CO.	
Power Supply:	7.4Vdc from LITHIUM-ION rechargeable battery or 12/24Vdc from DC Car battery	
	Battery:	Model No.: MS5760 , Supplier: Getac

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WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Peak)	Modulation Technology
11b/g	2412-2462	11	b: 19.23dBm g: 21.10dBm	DSSS OFDM
11n (2.4GHz)	HT20 2412-2462	11	n: 20.75dBm	OFDM
Antenna Designation:			PIFA Antenna, Antenna Gain: 0.76dBi.	
Modulation type			CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM	
Transition Rate:			802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 65Mbps	

This report applies for WLAN, and complies with FCC rule part 15C.

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IEEE 802.11n Spec:

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Datarate(Mbps)			
									800nsGI		400nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bite per single carrier
NCBPS	Number of coded bite per symbol
NDBPS	Number of data bite per symbol
GI	Guard interval

802.11n_HT20 MCS8 -15

MCS Index	Modulation	R	$N_{BPSCS}(i_{SS})$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI (see NOTE)
8	BPSK	1/2	1	52	4	104	52	13.0	14.4
9	QPSK	1/2	2	52	4	208	104	26.0	28.9
10	QPSK	3/4	2	52	4	208	156	39.0	43.3
11	16-QAM	1/2	4	52	4	416	208	52.0	57.8
12	16-QAM	3/4	4	52	4	416	312	78.0	86.7
13	64-QAM	2/3	6	52	4	624	416	104.0	115.6
14	64-QAM	3/4	6	52	4	624	468	117.0	130.0
15	64-QAM	5/6	6	52	4	624	520	130.0	144.4
NOTE—The 400 ns GI rate values are rounded to 1 decimal place.									

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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: NKS-MS5** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B under the DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4:2014 and ANSI C63.10:2013. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Jun 2014 KDB558074 D01 V03r02 ompliance to FCC 47CFR 15.247 requirements.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan, which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014 & ANSI C63.10:2013. FCC Registration Number is: 628985, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County,Taiwan which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. FCC Registration Number: 455997.

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2014 & 6.2 ANSI C63.10:2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI C63.4:2014 & 6.2.2, and 6.2.3 in ANSI C63.10:2013 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna. according to the requirements Section 8 and 13 and of ANSI C63.4:2014, & Section 6.3, 6.4, 6.5, and 6.6 of ANSI C63.10:2013.

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2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission & Conduction Emission Configuration

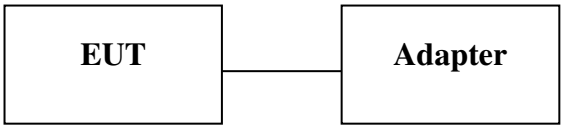

Fig. 2-2 Conducted (Antenna Port) Configuration

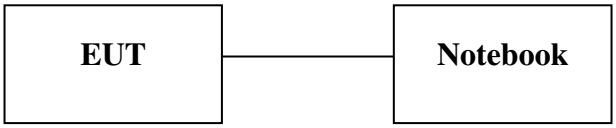

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	R9-YYG88	N/A	Unshielded

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(d)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d)	Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.
Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

802.11 b mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 1Mbps lowest data rate are chosen for full testing.

802.11 g mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 6Mbps lowest data rate are chosen for full testing.

802.11 n_20MHz mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 6.5Mbps lowest data rate are chosen for full testing.

The worst case is determined by the output power that generates the highest emission. As examined in the section of output power measurement, the section 7.5, the lowest data rate at b/g/n resulted the highest level of fundamental emission, and therefore, the lowest data rate is chosen as the worst-case to conduct the remaining of other mandatory test cases.

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E2 Position was tested as resulted in pre-scanned measurement with respect to 2.4GHz.

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 1.55dB (for Spectrum) +/- 1.42 dB (for Power Meter)
6dB Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Peak Power Density	+/- 1.55 dB
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : **Vertical**)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : **Horizontal**)	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable:

According to §15.207, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note
1.The lower limit shall apply at the transition frequencies
2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI 3	101311	06/20/2014	06/19/2015
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	01/06/2015	01/07/2016
LISN	Schwarzbeck	NSLK 8127	8127-648	06/10/2014	06/09/2015
LISN	Rolf-Heine	NNB-2/16Z	99012	03/26/2014	03/25/2015
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4:2014.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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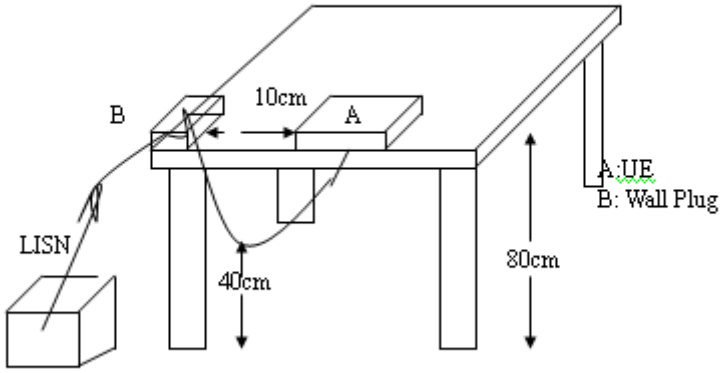
6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

6.6 Measurement Result:

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit

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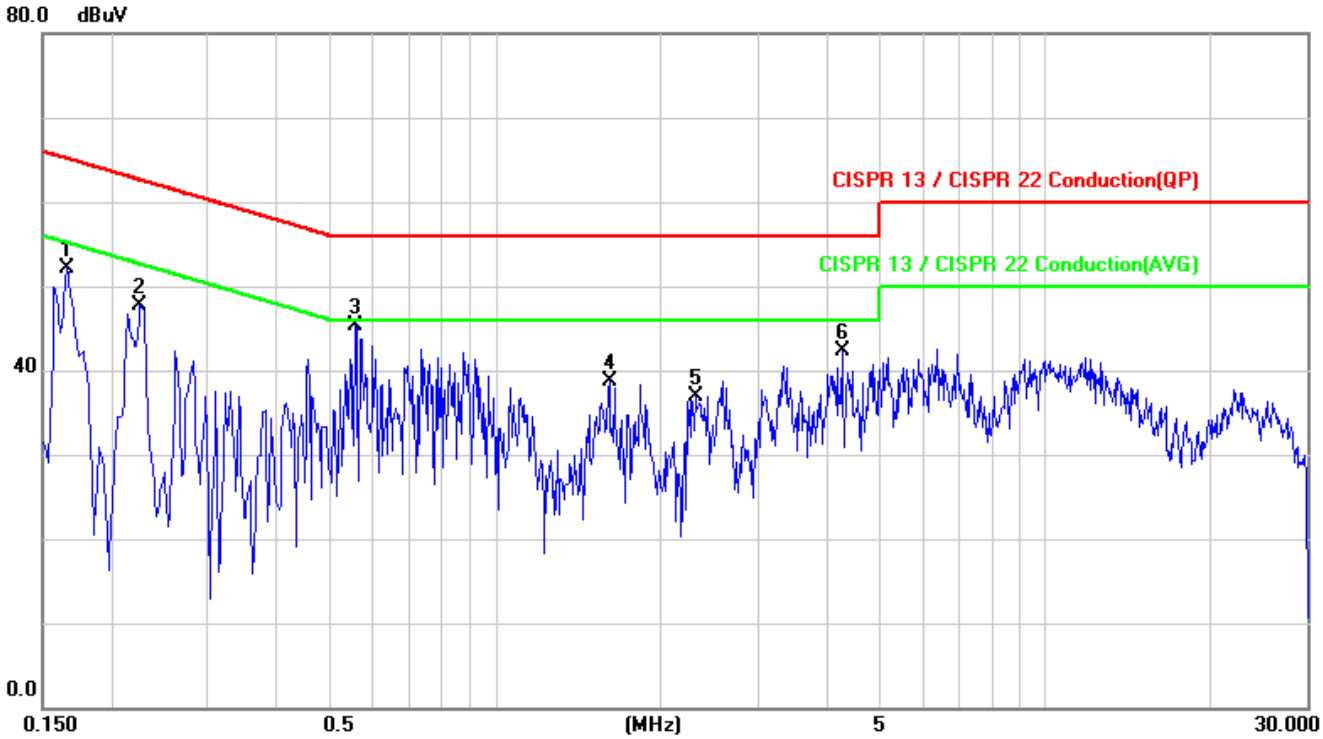
AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode			Test Date:	Feb. 26, 2015
Temperature:	23 ℃	Humidity:	58 %	Test By:	Vito
Probe:	L1				



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1660	52.15	0.05	52.20	65.16	-12.96	peak	
2		0.2260	47.72	0.05	47.77	62.60	-14.83	peak	
3	*	0.5580	45.17	0.20	45.37	56.00	-10.63	peak	
4		1.6140	38.24	0.45	38.69	56.00	-17.31	peak	
5		2.3180	36.43	0.51	36.94	56.00	-19.06	peak	
6		4.2860	41.89	0.50	42.39	56.00	-13.61	peak	

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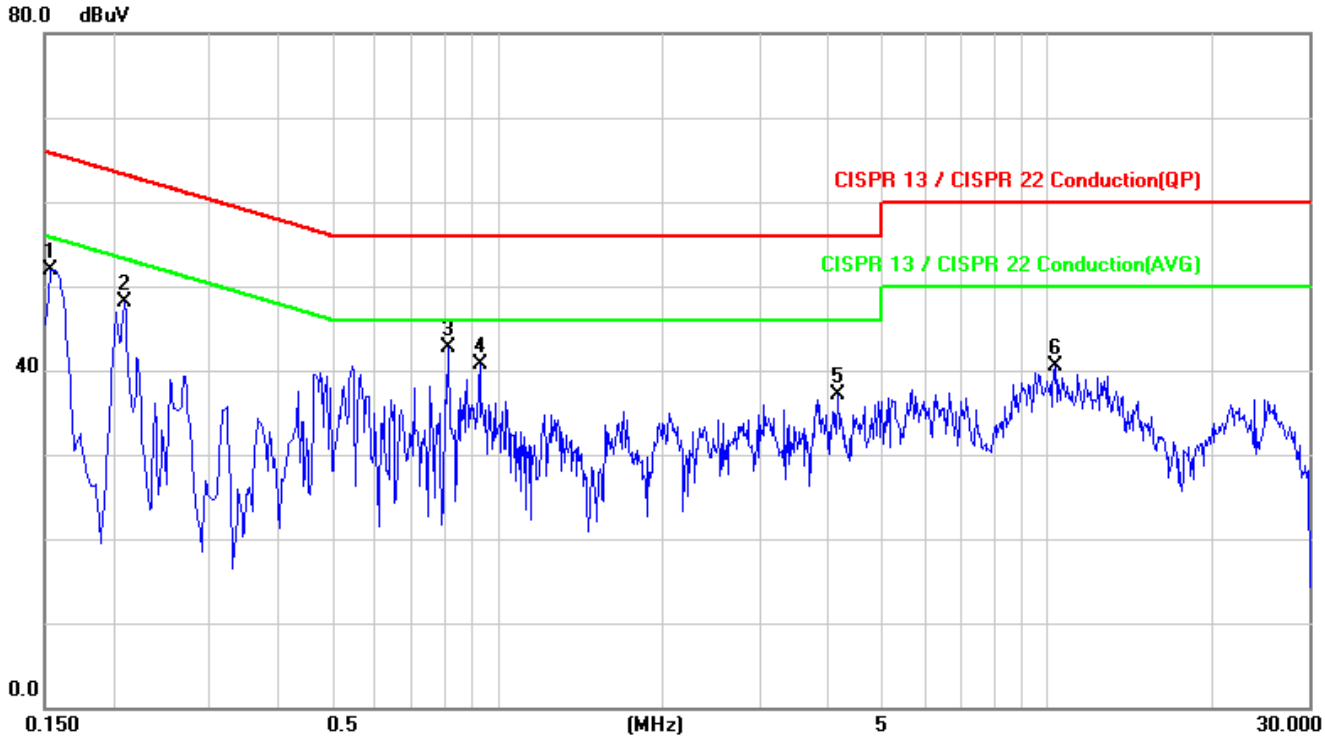
Operation Mode:	Operation Mode			Test Date:	Feb. 26, 2015
Temperature:	23 ℃	Humidity:	58 %	Test By:	Vito
Probe:	N				



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1540	51.84	0.05	51.89	65.78	-13.89	peak	
2		0.2100	48.04	0.04	48.08	63.21	-15.13	peak	
3	*	0.8140	42.47	0.30	42.77	56.00	-13.23	peak	
4		0.9300	40.35	0.34	40.69	56.00	-15.31	peak	
5		4.1660	36.51	0.51	37.02	56.00	-18.98	peak	
6		10.3620	39.97	0.47	40.44	60.00	-19.56	peak	

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7 PEAK OUTPUT POWER MEASUREMENT

7.1 Standard Applicable:

According to §15.247 (b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	10/15/2014	10/14/2015
Power Meter	Anritsu	ML2496A	1326001	06/21/2014	06/20/2015
Power Sensor	Anritsu	MA2411B	1315048	06/21/2014	06/20/2015
Power Sensor	Anritsu	MA2411B	1315049	06/21/2014	06/20/2015
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/19/2014	12/18/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
DC Power Supply	Agilent	E3640A	MY53140006	05/31/2014	05/30/2015

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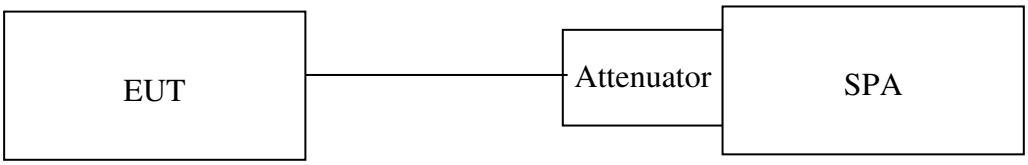
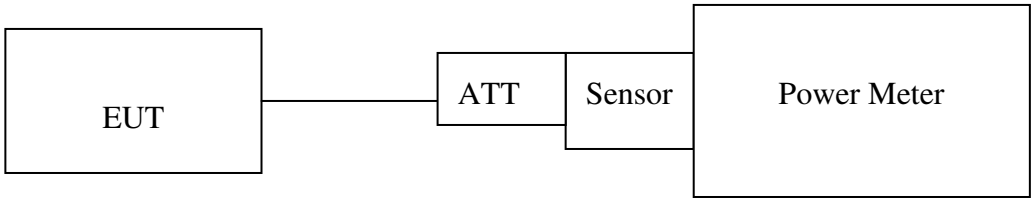
7.3 Test Set-up:

Spectrum:



Power Meter:



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7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (**Peak power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector =peak, Sweep = Auto.
(**Avg. power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector =Avg., Trace avg =100, Sweep = Auto, Setting on spectrum is adjusted based on the mandatory procedure in 9.2.2.4 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.2.3, option 3 in KDB558074 is followed.
3. Record the max. Reading as observed from Spectrum or Power Meter.
4. Repeat above procedures until all frequency of interest measured was complete.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Test Procedure:

Set span = 0, RBW = 8MHz, VBW = 8MHz, Detector = Peak

Duty Cycle:

	Duty Cycle	Duty Factor (dBm)
802.11b	0.985	0.07
802.11g	0.986	0.06
802.11n_20 (2.4G)	0.985	0.07

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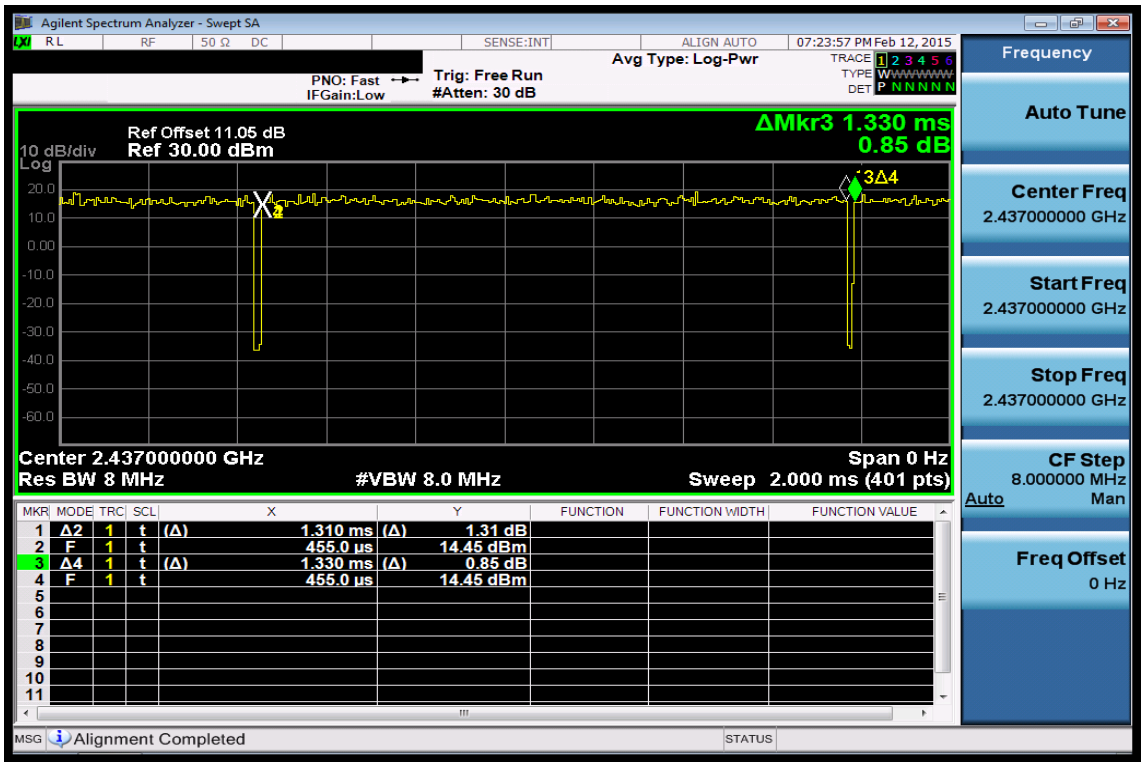
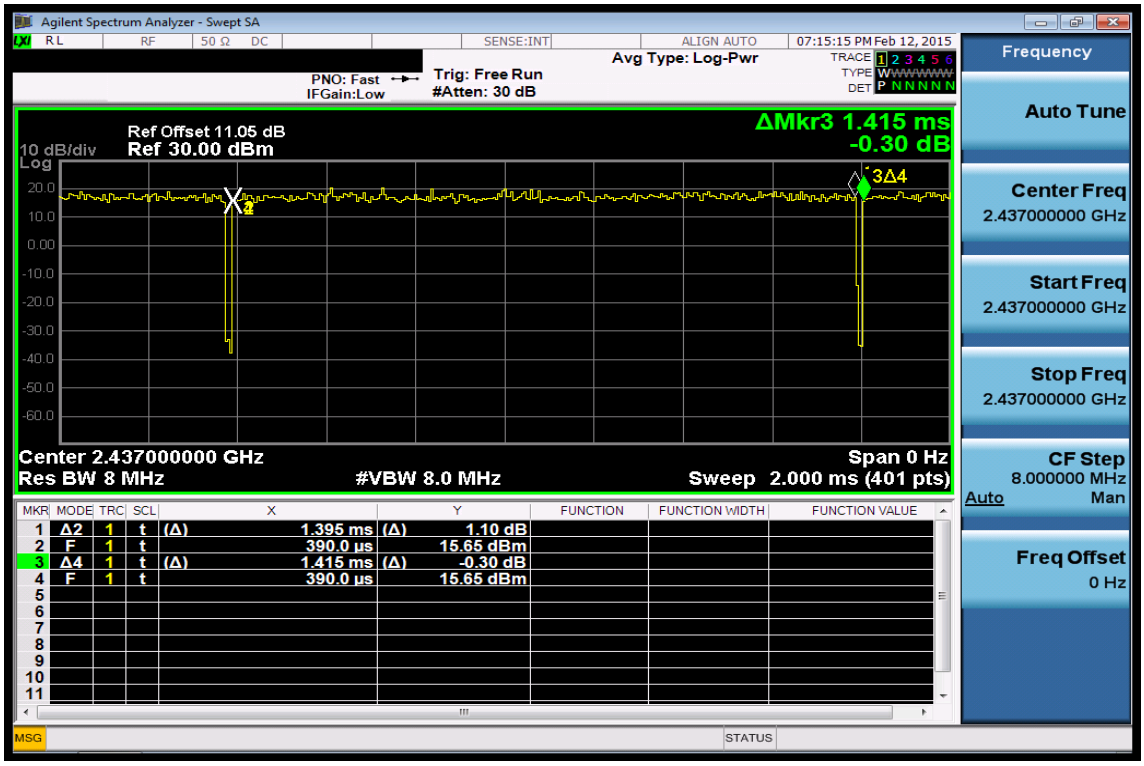
Duty Factor:

802.11 b



802.11 g



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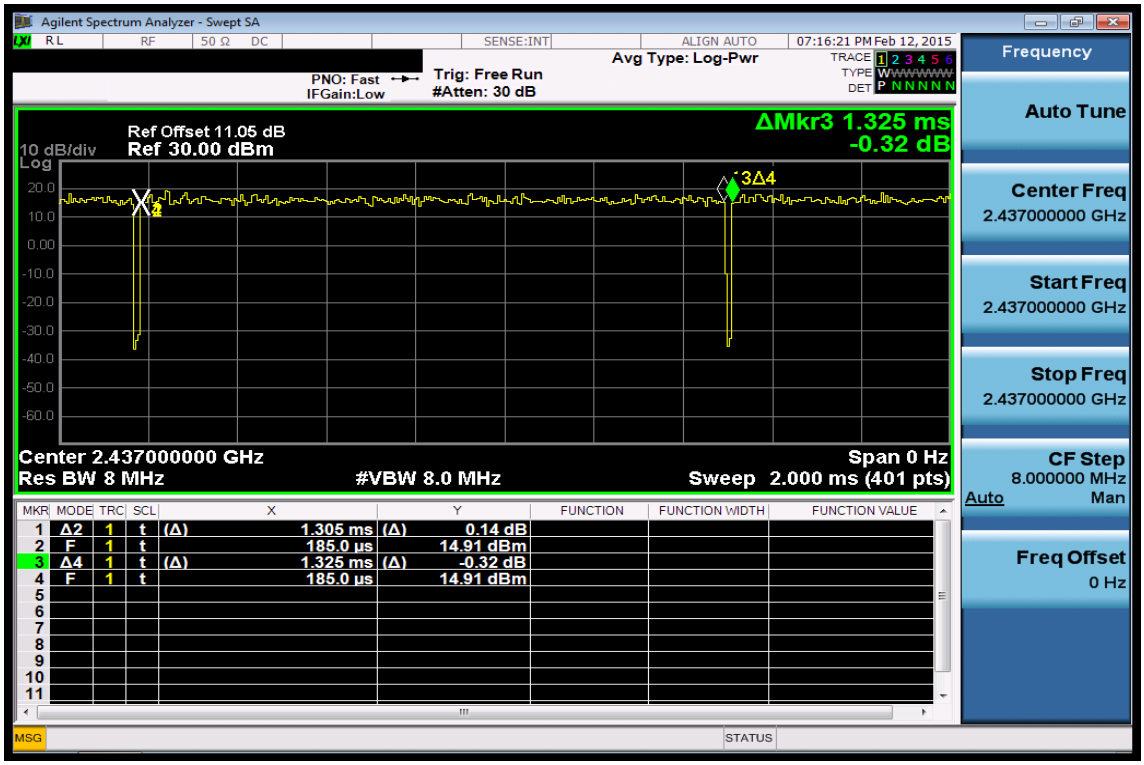
802.11 n_20 MHz



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7.5 Measurement Result:

802.11b

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	19.11	1 Watt = 30 dBm
6	2437	**19.23**	1 Watt = 30 dBm
11	2462	19	1 Watt = 30 dBm

Max. Rated Avg. Power + Max. Tolerance (dBm): 17dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	16.75	1 Watt = 30 dBm
6	2437	16.88	1 Watt = 30 dBm
11	2462	16.59	1 Watt = 30 dBm

802.11g

		Peak Power Output(dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	20.89	1 Watt = 30 dBm
6	2437	**21.10**	1 Watt = 30 dBm
11	2462	20.69	1 Watt = 30 dBm

Max. Rated Avg. Power + Max. Tolerance (dBm): 14dBm

		Average Power Output(dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	13.01	1 Watt = 30 dBm
6	2437	13.89	1 Watt = 30 dBm
11	2462	12.31	1 Watt = 30 dBm

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802.11n_20M

		Peak Power Output(dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
1	2412	20.75	1 Watt = 30 dBm
6	2437	20.67	1 Watt = 30 dBm
11	2462	20.15	1 Watt = 30 dBm

Max. Rated Avg. Power + Max. Tolerance (dBm): 13dBm

		Average Power Output(dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
1	2412	12.61	1 Watt = 30 dBm
6	2437	12.62	1 Watt = 30 dBm
11	2462	11.21	1 Watt = 30 dBm

**** Note: The duty cycle factor is compensated back to obtain the maximum value of the measurement in average.***

**** Note: Offset 11.05dB for 2.4G 802.11b/g/n_20***

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8 6dB BANDWIDTH

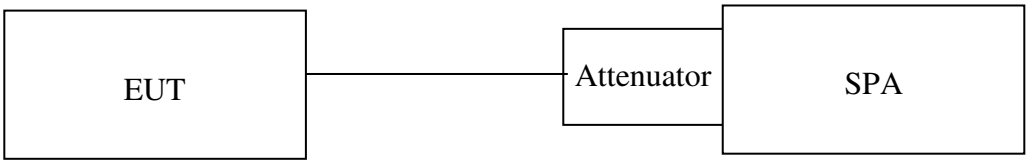
8.1 Standard Applicable:

According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902 - 928 MHz,2400 - 2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500kHz.

8.2 Measurement Equipment Used:

Refer to section 7.2 for details.

8.3 Test Set-up:



8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto, the setting on spectrum is adjusted based on the procedure as guide in 8.1 option 1 of KDB558074.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency of interest measured was complete.

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8.5 Measurement Result:

802.11b

Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
2412	7.86	> 500	PASS
2437	8.34	> 500	PASS
2462	7.13	> 500	PASS

802.11g

Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
2412	16.39	> 500	PASS
2437	16.40	> 500	PASS
2462	16.39	> 500	PASS

802.11n_20M

Frequency (MHz)	Bandwidth (MHz)	Limit (kHz)	Result
2412	17.62	> 500	PASS
2437	17.62	> 500	PASS
2462	17.62	> 500	PASS

** Note: Offset 11.2dB for 2.4G 802.11b/g/n_20, and the diamond reveals X decibel level*

**Refer to next page for plots*

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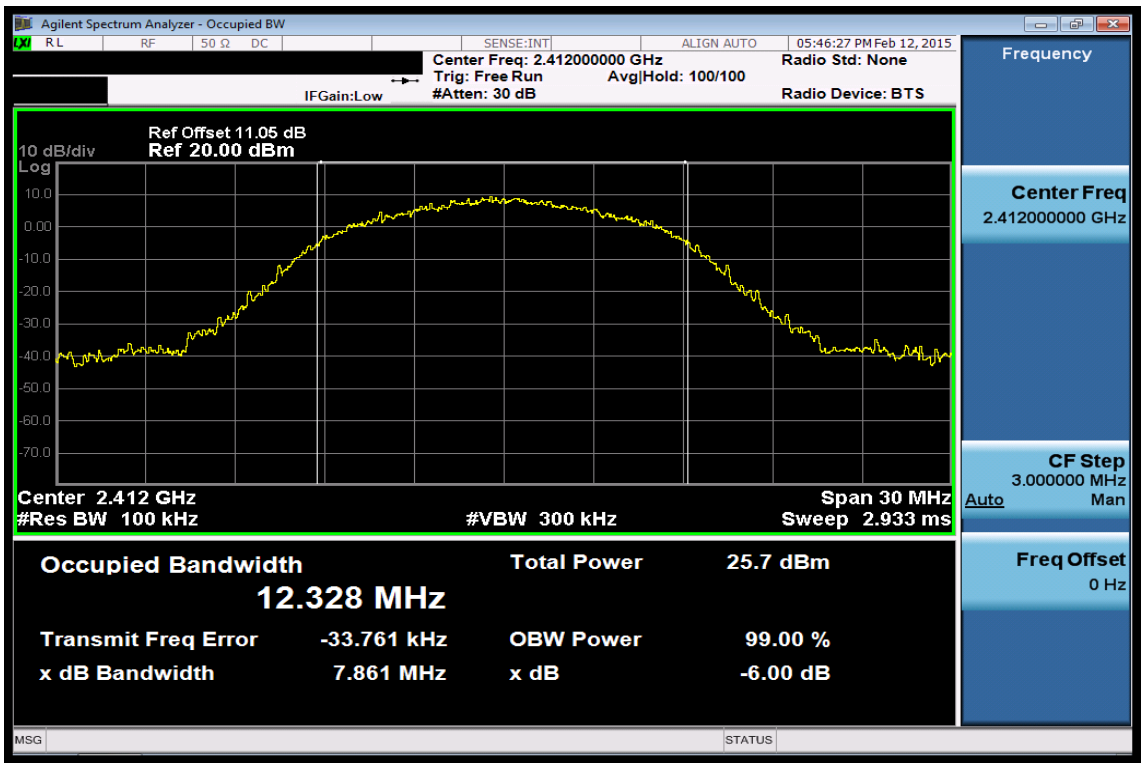
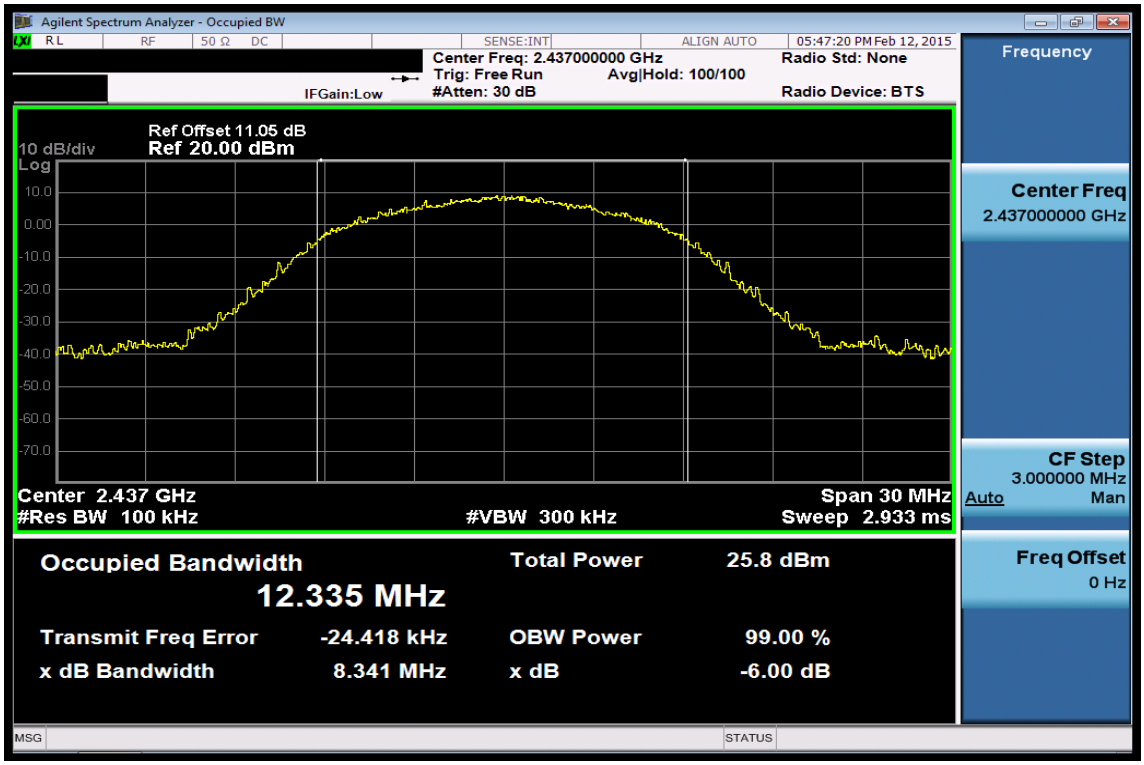
802.11b

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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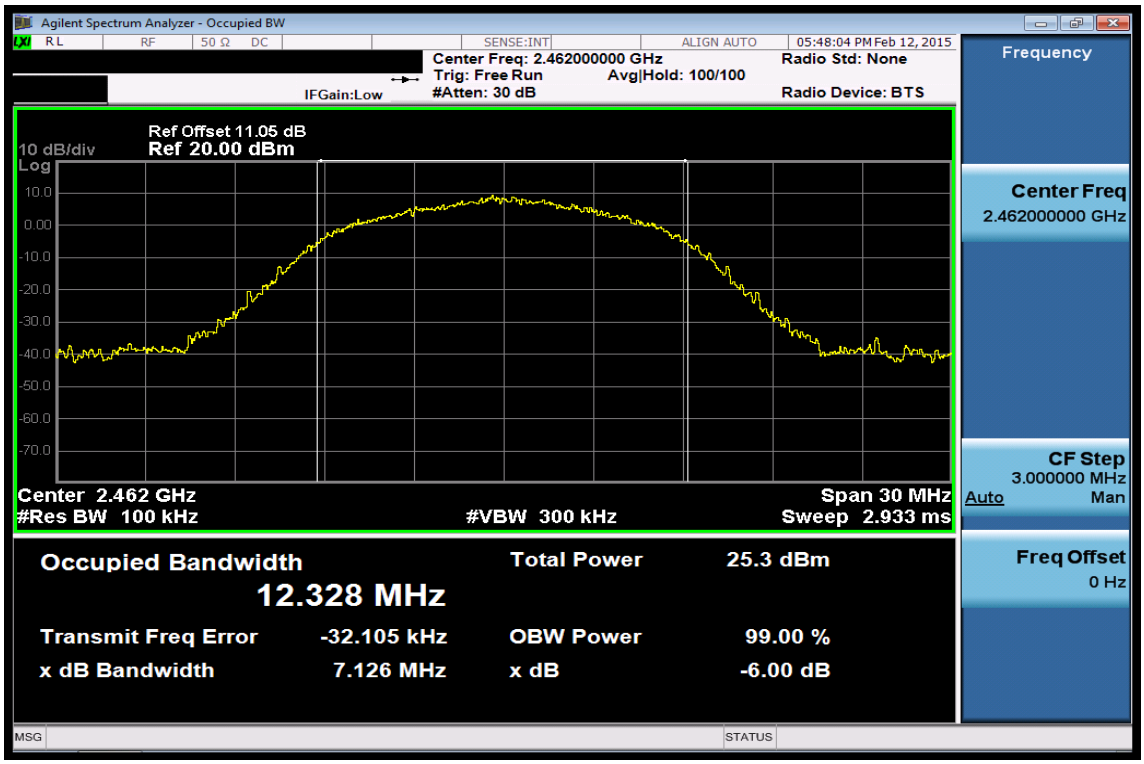
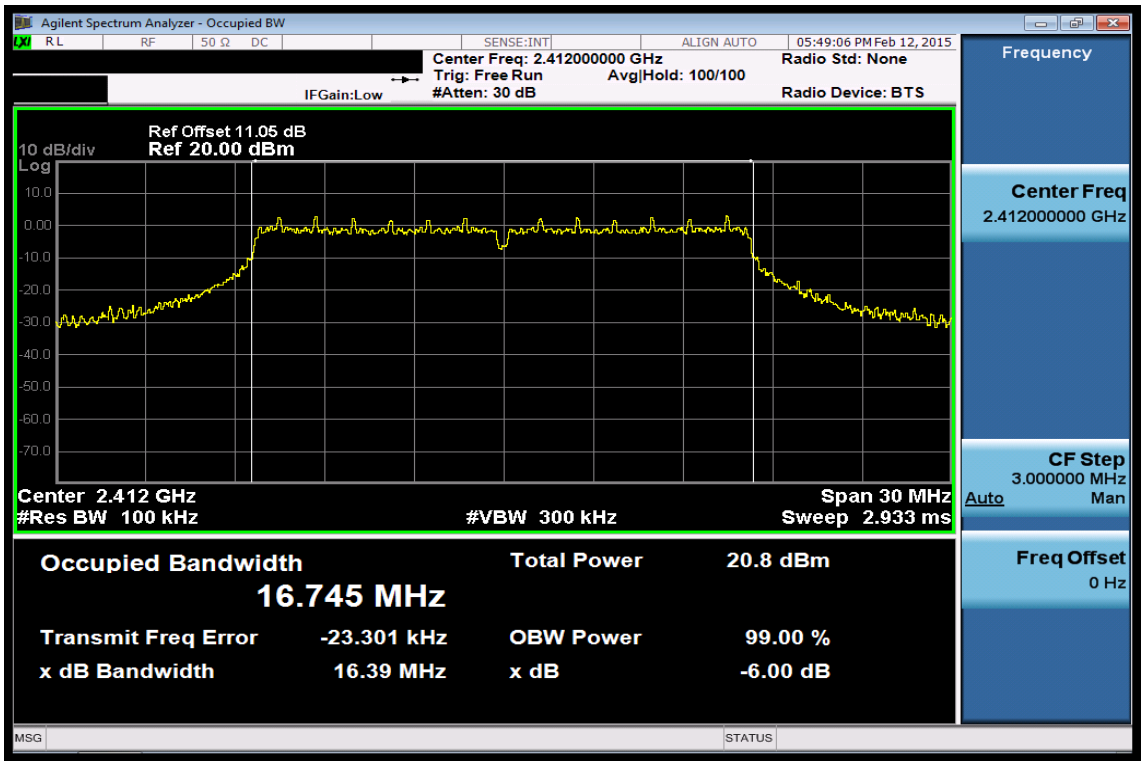
6dB Band Width Test Data CH-High



802.11g

6dB Band Width Test Data CH-Low



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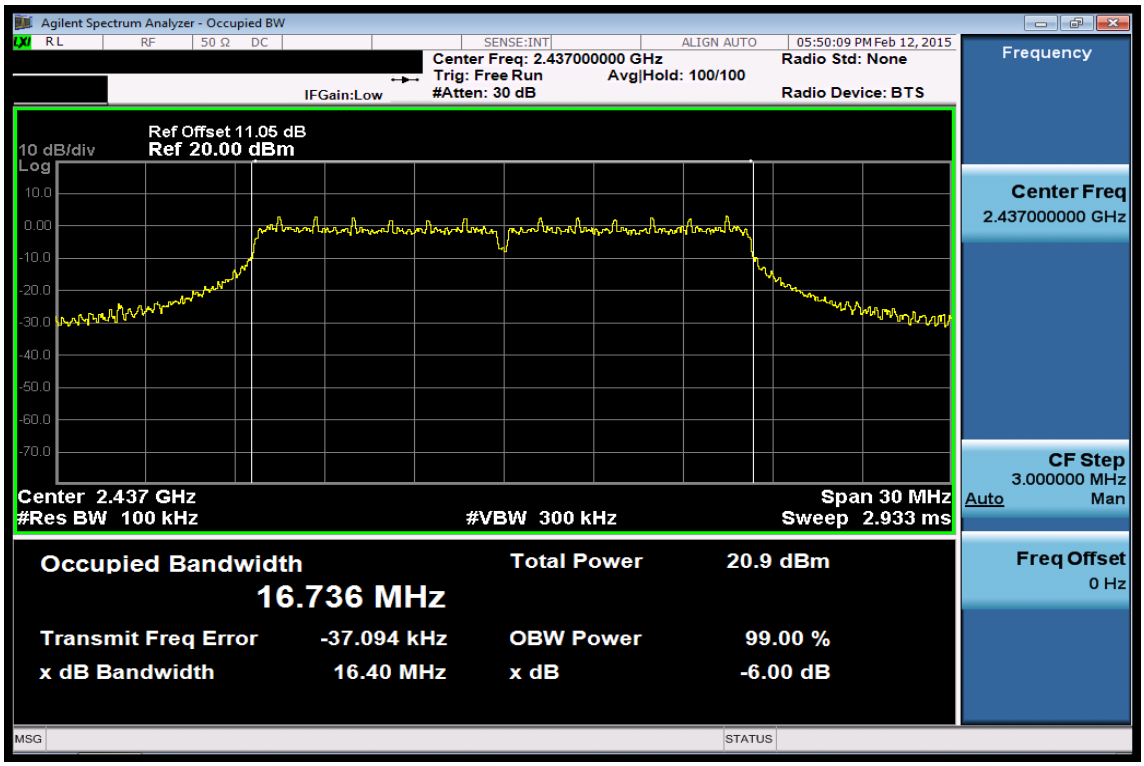
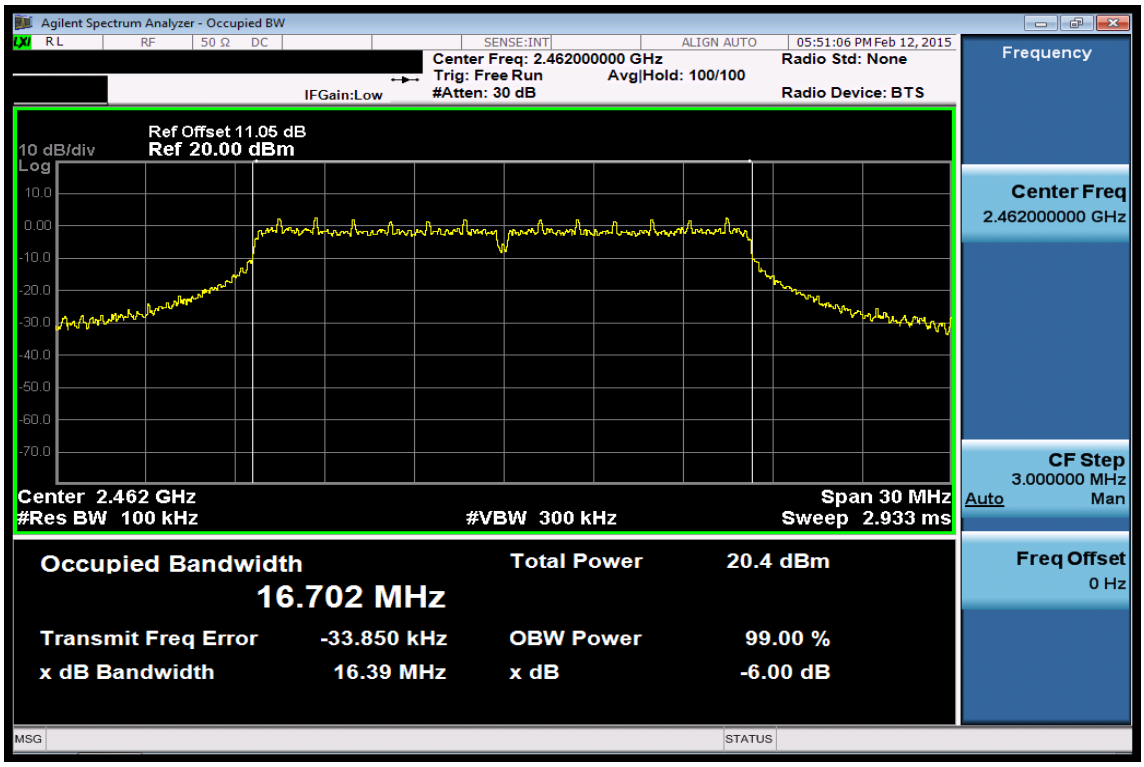
6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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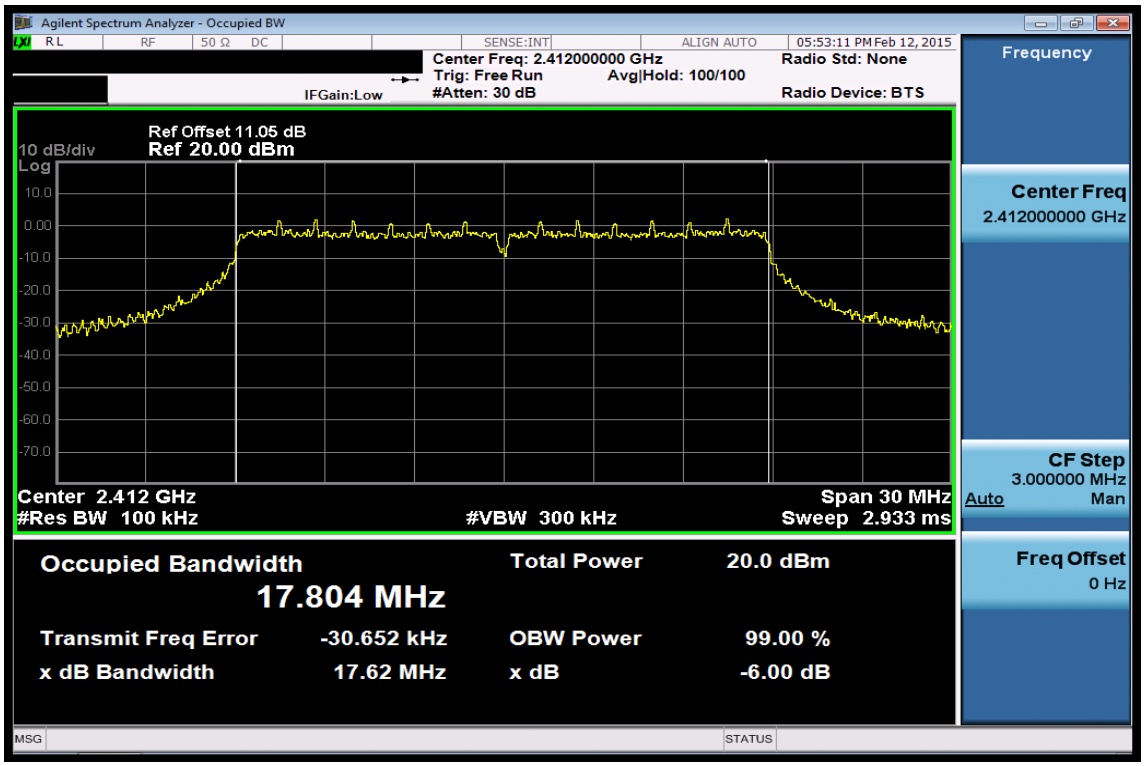
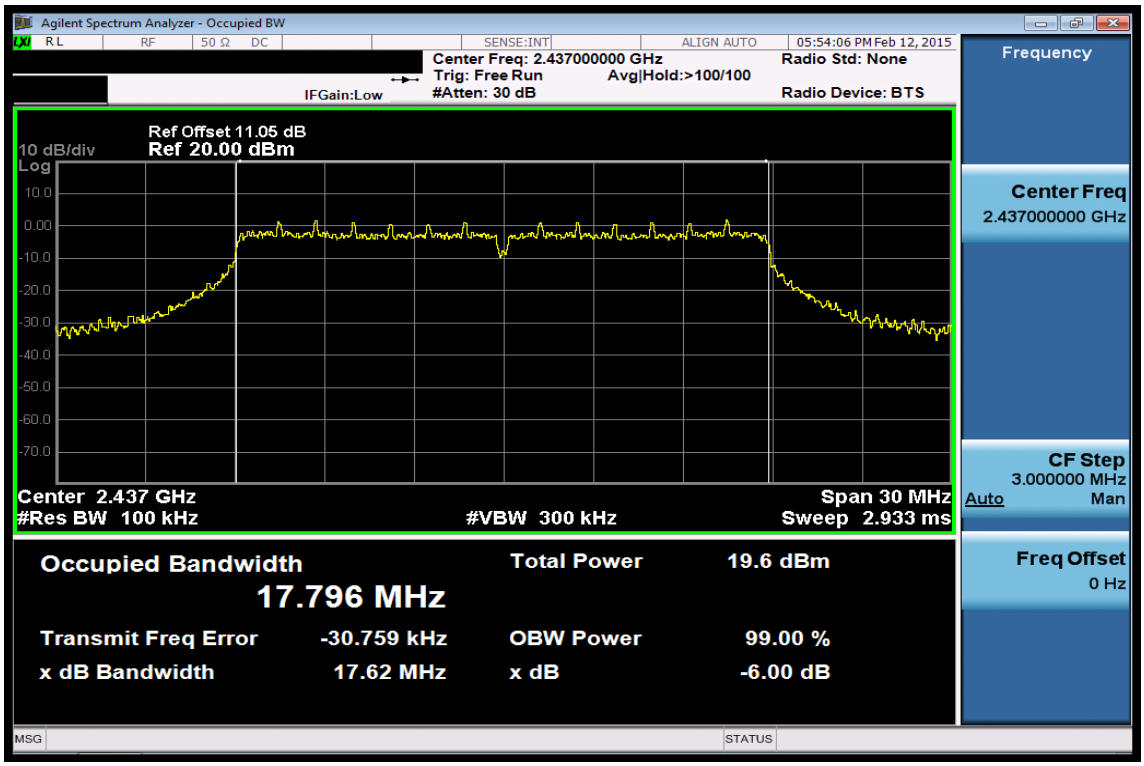
802.11n_20M

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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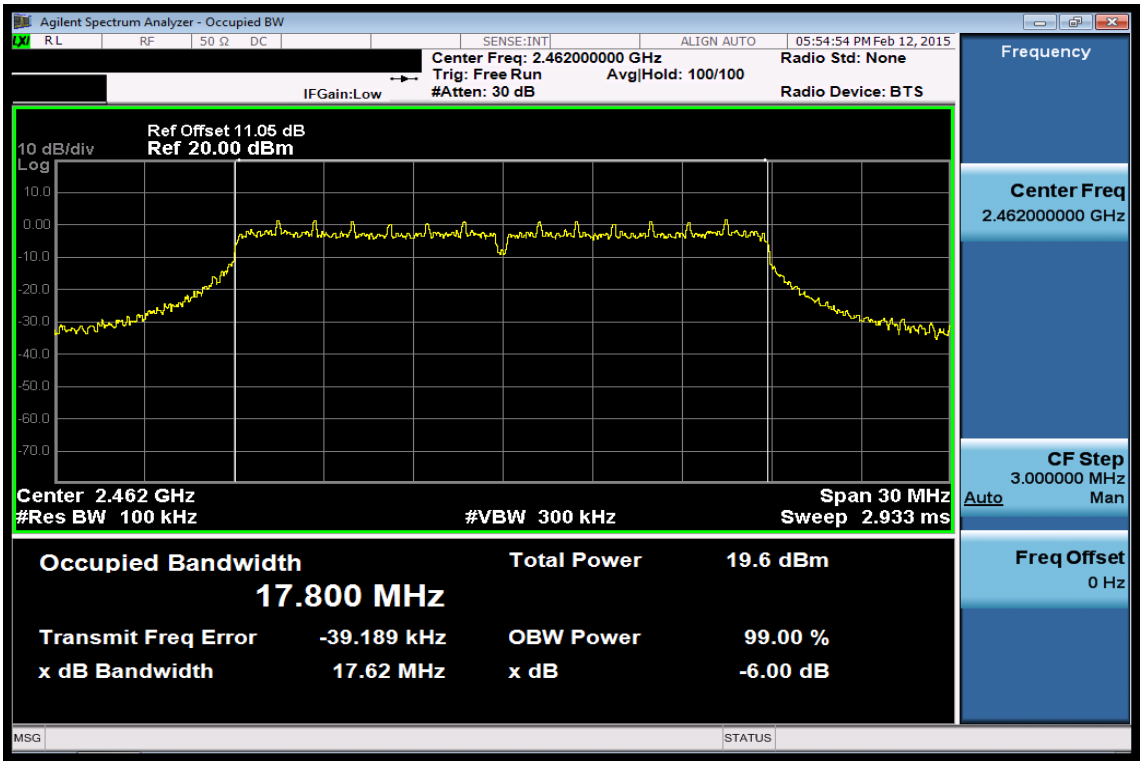
6dB Band Width Test Data CH-High



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9 BAND EDGES MEASUREMENT

9.1 Standard Applicable:

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

9.2 Measurement Equipment Used:

9.2.1 Conducted Emission at antenna port:

Refer to section 7.2 for details.

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9.2.2 Radiated emission:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESU 40	100363	04/12/2014	04/11/2015
Loop Antenna	ETS-Lindgren	6502	00143303	12/09/2014	12/08/2015
Broadband Antenna	TESEQ	CBL 6112D	35240	12/05/2014	12/04/2015
Horn Antenna	ETS-Lindgren	3117	00143272	12/08/2014	12/07/2015
Horn Antenna	ETS-Lindgren	3160-09	00117911	11/13/2014	11/12/2015
Horn Antenna	ETS-Lindgren	3160-10	00117783	11/13/2014	11/12/2015
Pre Amplifier	EMC Instruments	EMC330	980096	12/19/2014	12/18/2015
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-18	10204	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-26	100780	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF27	12/19/2014	12/18/2015
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
DC Power Supply	HOLA	DP-3003	D7070035	05/31/2014	05/30/2015
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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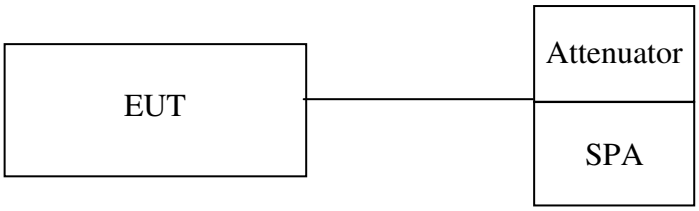
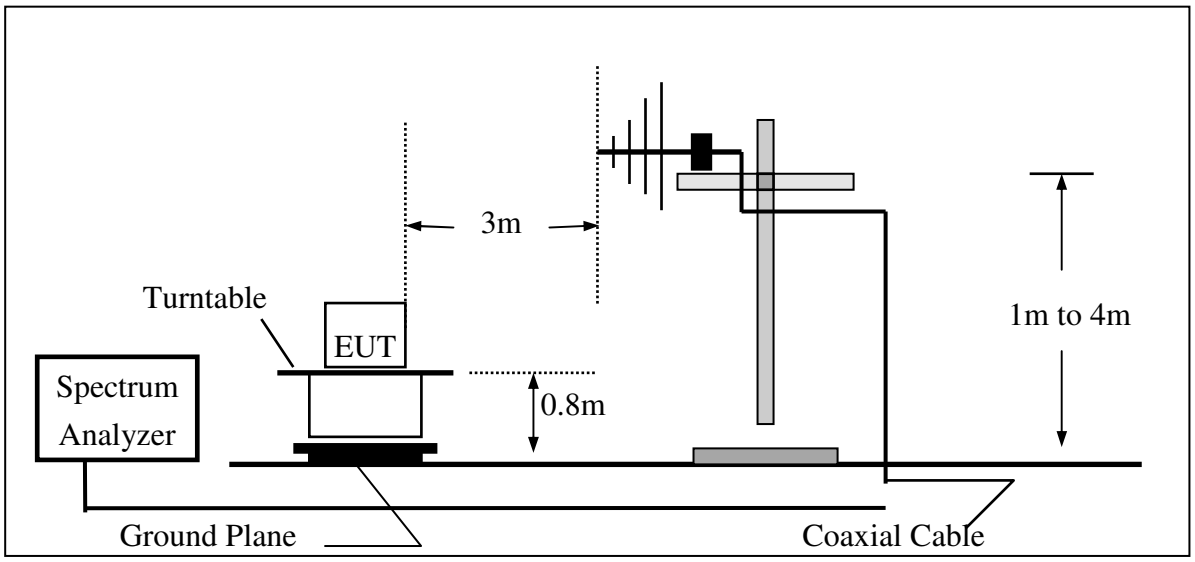
9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

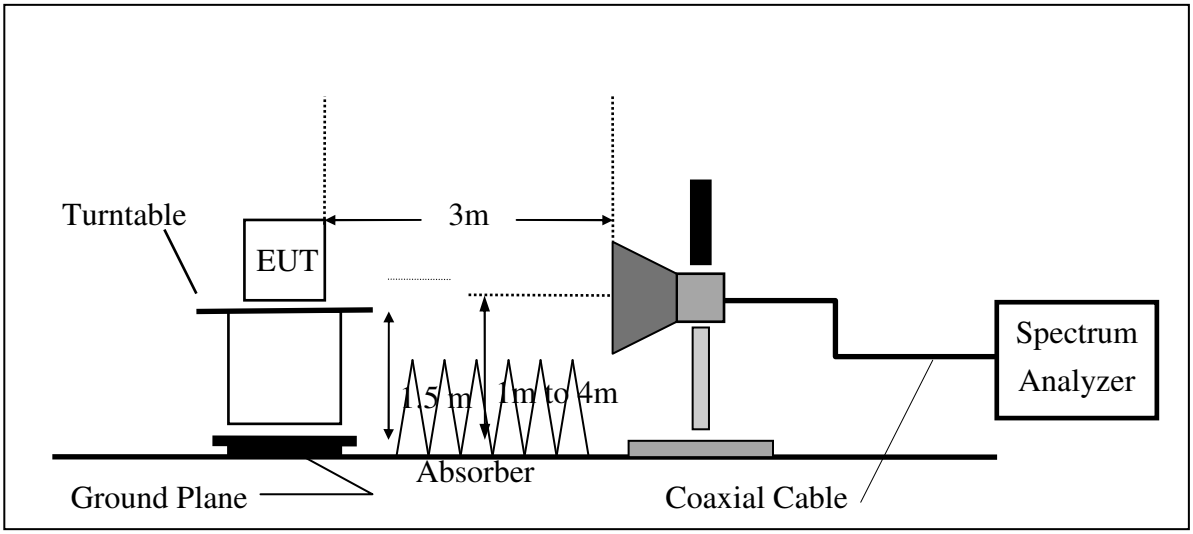


9.3.2 Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



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9.4 Measurement Procedure:

Unwanted Emissions into Non-Restricted Frequency Bands, Measurement Procedure followed by 11.1 of KDB558074 D01

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
4. Set the spectrum analyzer as RBW, VBW=300KHz, Detector = Peak, Sweep = auto
5. Mark the highest reading of the emission as the reference level measurement.
6. Set DL as the limit = reading on marker 1 – 20dBm
7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 KHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Unwanted Emission falling into Restricted Frequency Bands, Measurement Procedure followed by 12.1 of KDB558074 D01

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. On spectrum, following 8.1.2, and RBW = 1MHz, VBW = 3MHz, & Marker 2390MHz, and 2483.5MHz (Peak Measurement). Average Measurement: following 8.2 with the modification span to 1MHz, &RBW = 1MHz, VBW = 3MHz and peak marker function to obtain the highest reading on 2390, and 2483.5MHz.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete

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9.5 Field Strength Calculation:

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

9.6 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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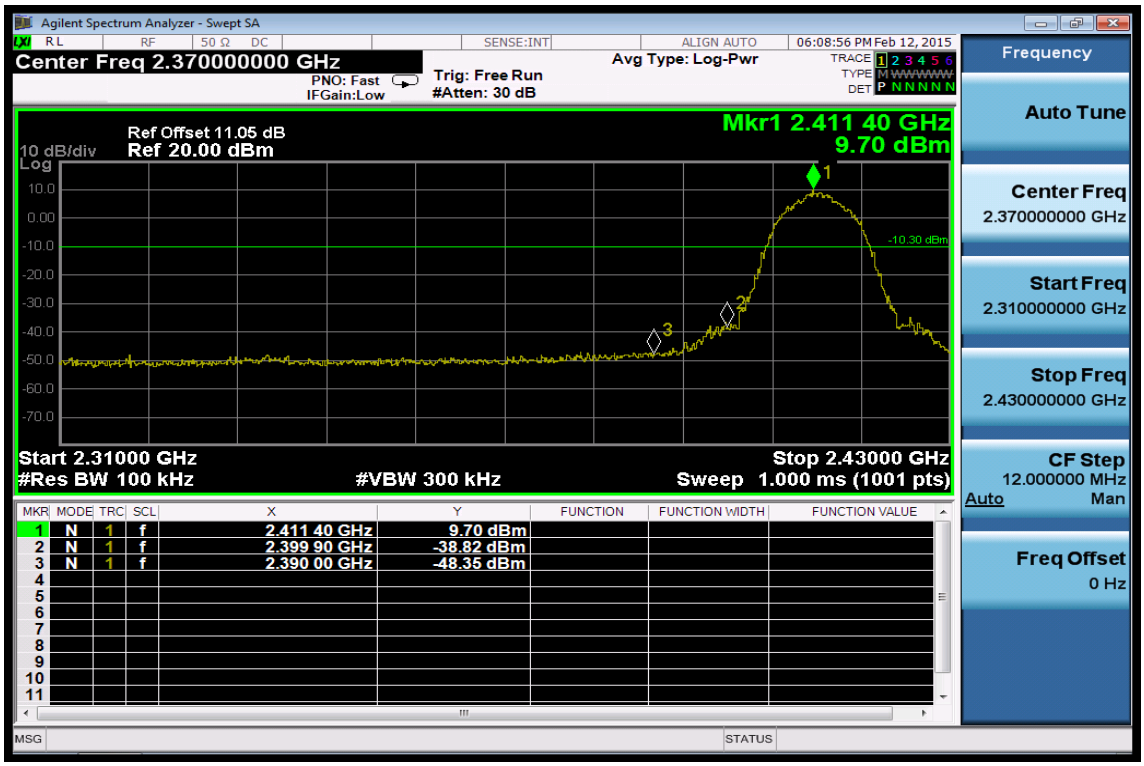
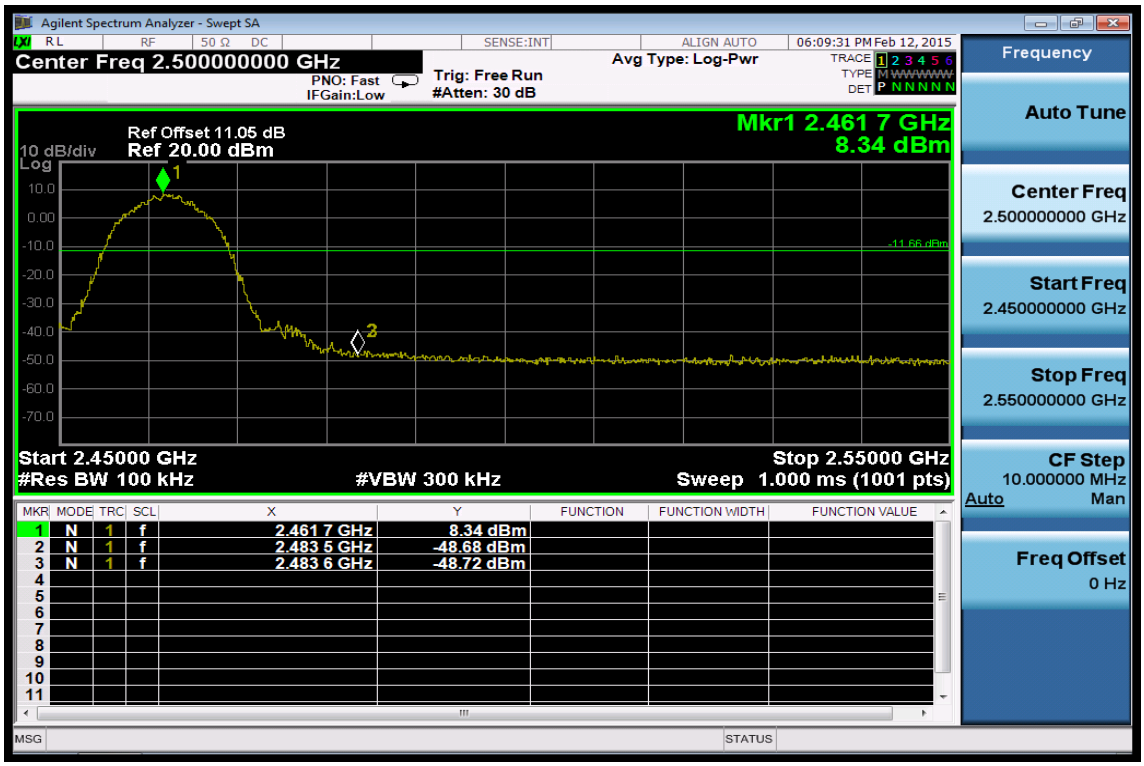
802.11b - Unwanted Emissions into Non-Restricted Frequency Bands

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission:

(Unwanted Emissions into Restricted Frequency Bands): 802.11 b mode

Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	44.29	6.36	50.65	74.00	-23.35
2390.00	E	Average	32.95	6.36	39.31	54.00	-14.69

Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	48.05	6.36	54.41	74.00	-19.59
2390.00	E	Average	34.57	6.36	40.93	54.00	-13.07

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Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	44.29	7.14	51.43	74.00	-22.57
2483.50	E	Average	33.27	7.14	40.41	54.00	-13.59

Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	50.22	7.14	57.36	74.00	-16.64
2483.50	E	Average	36.69	7.14	43.83	54.00	-10.17

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802.11g - Unwanted Emissions into Non-Restricted Frequency Bands

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

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Radiated Emission:

(Unwanted Emissions into Restricted Frequency Bands): 802.11 g mode

Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	58.14	6.36	64.49	74.00	-9.51
2390.00	E	Average	34.92	6.36	41.28	54.00	-12.72

Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	65.38	6.36	71.74	74.00	-2.26
2390.00	E	Average	40.74	6.36	47.10	54.00	-6.90

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Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	58.11	7.14	65.25	74.00	-8.75
2483.50	E	Average	35.01	7.14	42.15	54.00	-11.85

Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	64.79	7.14	71.93	74.00	-2.07
2483.50	E	Average	40.49	7.14	47.63	54.00	-6.37

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802.11n_20M- Unwanted Emissions into Non-Restricted Frequency Bands

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

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Radiated Emission:

(Unwanted Emissions into Restricted Frequency Bands): 802.11 n_20M mode

Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	58.67	6.36	65.03	74.00	-8.97
2390.00	E	Peak	36.81	6.36	43.17	54.00	-10.83

Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	66.22	6.36	72.58	74.00	-1.42
2390.00	E	Peak	42.23	6.36	48.59	54.00	-5.41

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Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	60.70	7.14	67.84	74.00	-6.16
2483.50	E	Peak	41.83	7.14	48.97	54.00	-5.03

Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	65.95	7.14	73.08	74.00	-0.92
2483.50	E	Peak	42.47	7.14	49.61	54.00	-4.39

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10 SPURIOUS EMISSION TEST

10.1 Standard Applicable

According to §15.247(d),

Emission at antenna port:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Radiated Spurious Emission

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

10.2 Measurement Equipment Used:

10.2.1 Conducted Emission at antenna port:

Refer to section 7.2 for details.

10.2.2 Radiated emission:

Refer to section 9.2.2 for details.

10.3 Test SET-UP:

10.3.1 Conducted Emission at antenna port:

Refer to section 7.3 for details.

10.3.2 Radiated emission:

Refer to section 9.3.2 for details.

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10.4 Measurement Procedure:

Radiated Emission:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
7. Repeat above procedures until all default test channel measured were complete.

Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 300K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz, 18G to 40GHz (applicable if operation mode is 5GHz)
4. Via Software, combine 5 spans of frequency range into one plot
5. Repeat above procedures until all default test channel measured were complete.

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10.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

10.6 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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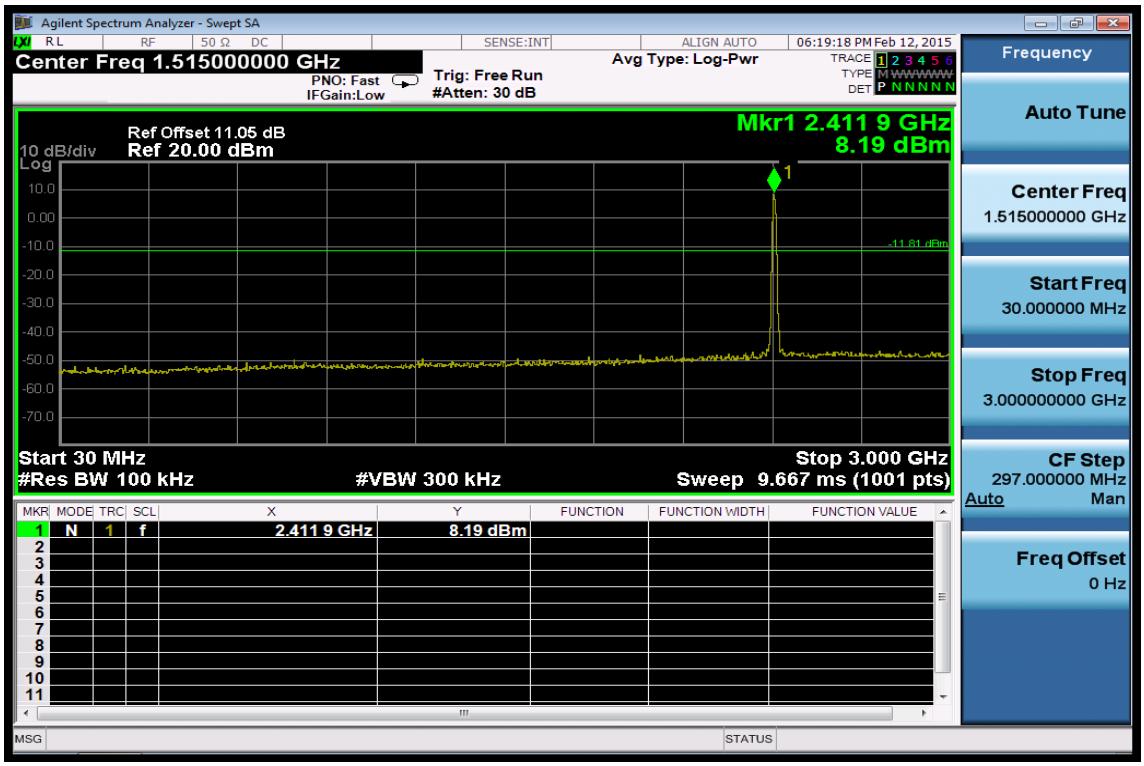
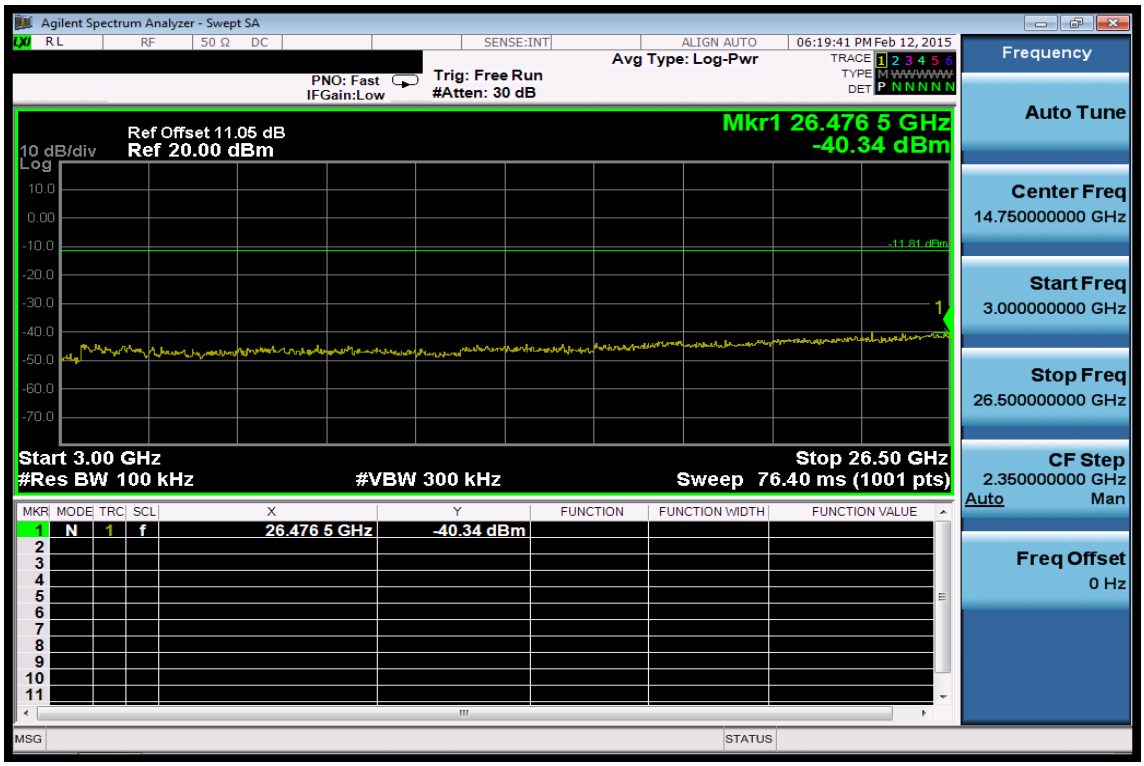
Conducted Spurious Emission Measurement Result (802.11b)

Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz



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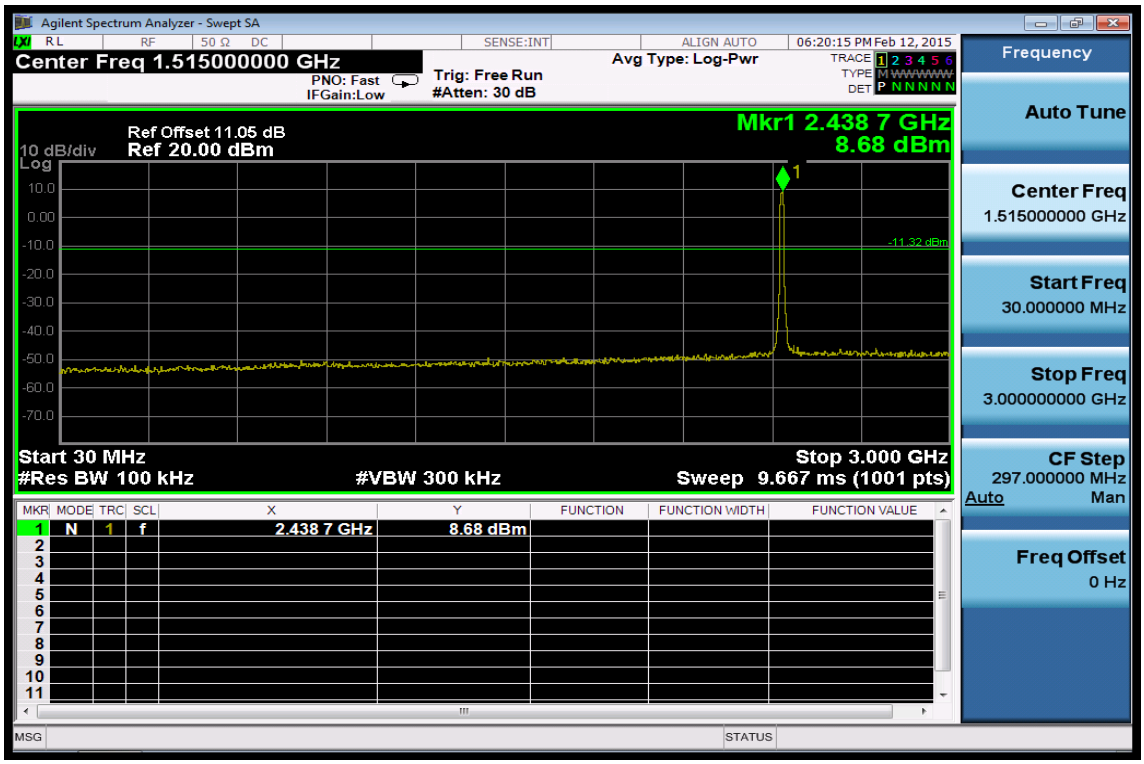
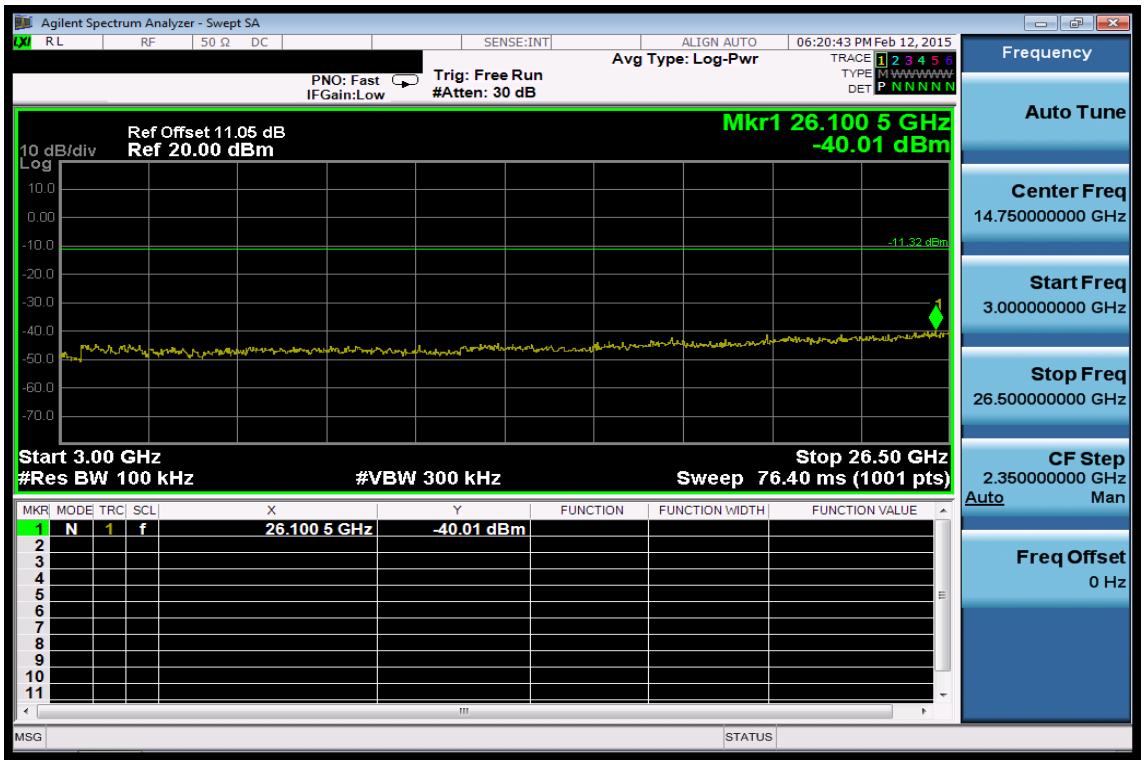
Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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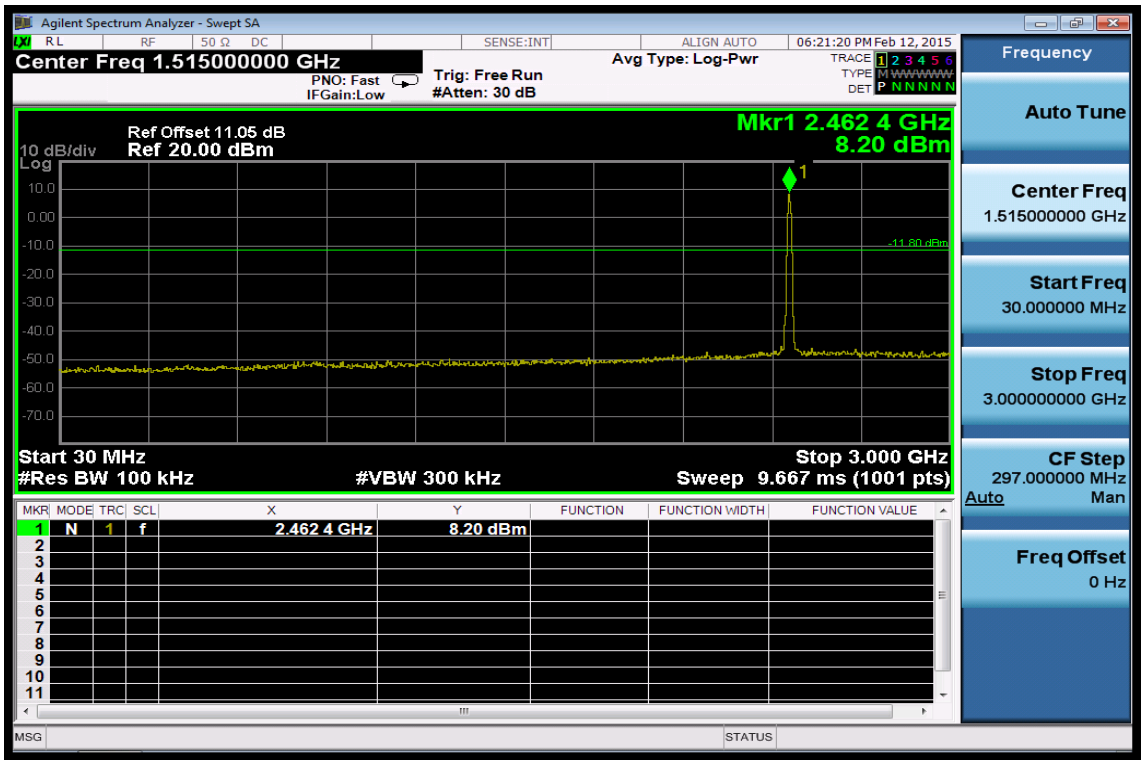
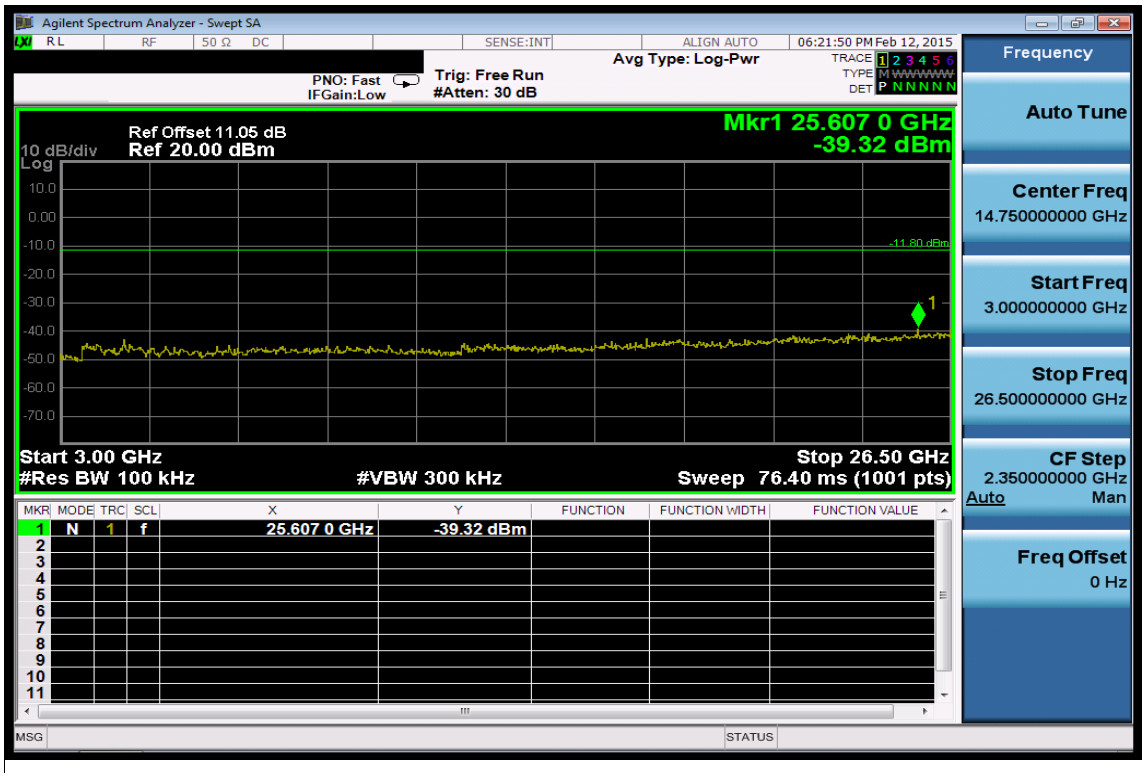
Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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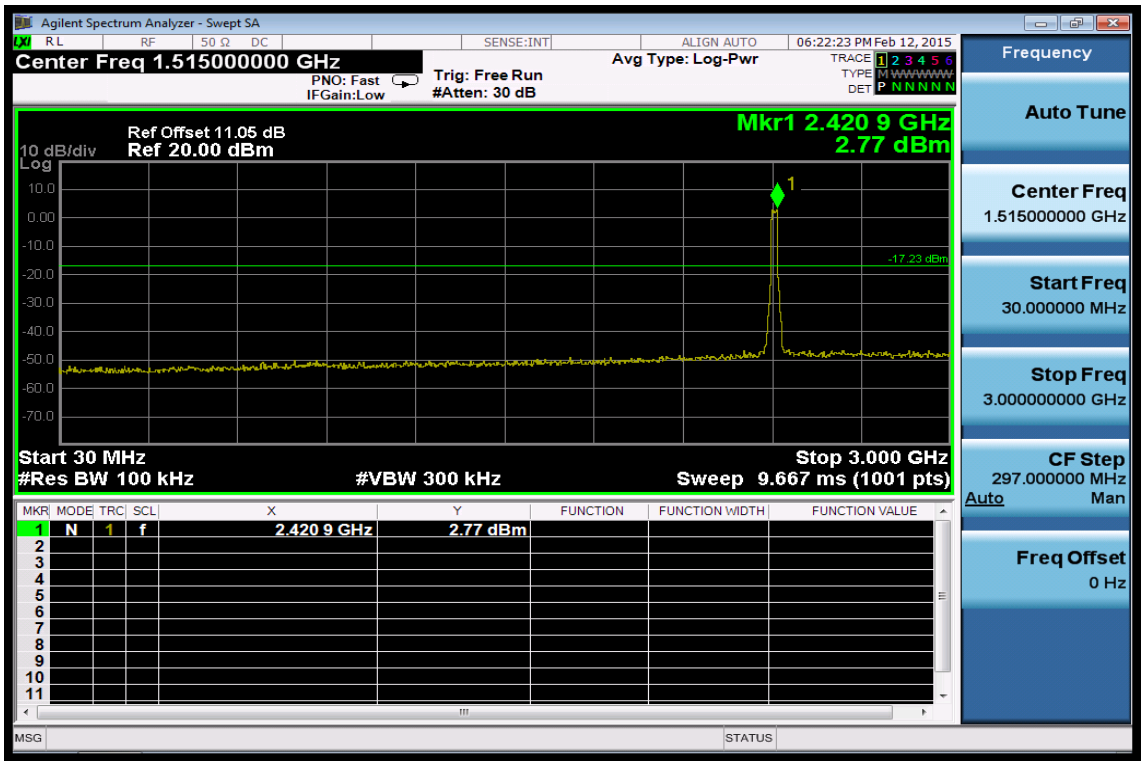
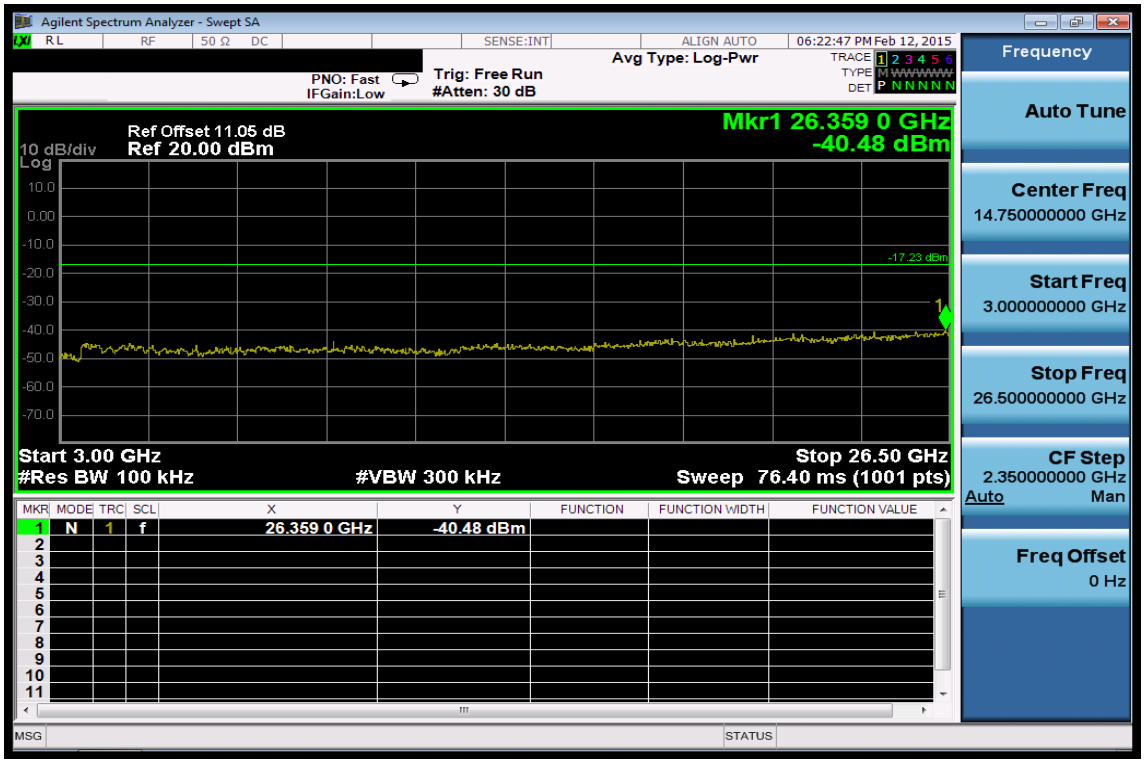
Conducted Spurious Emission Measurement Result (802.11g)

Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz



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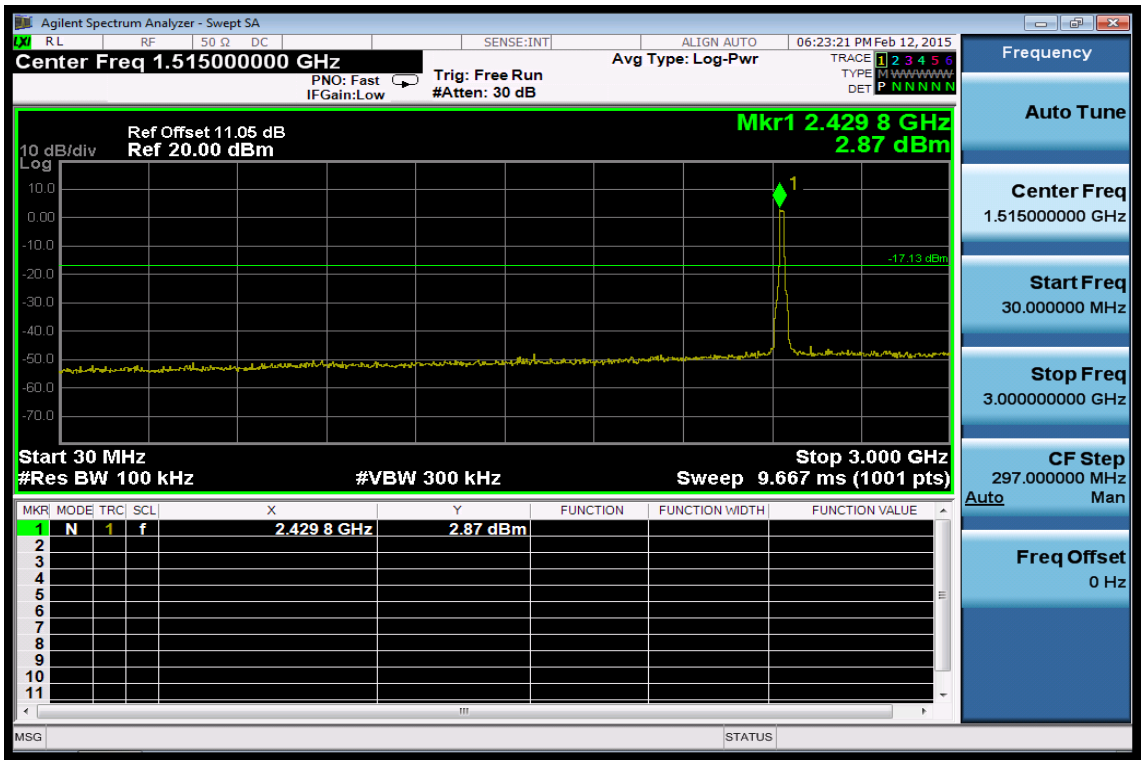
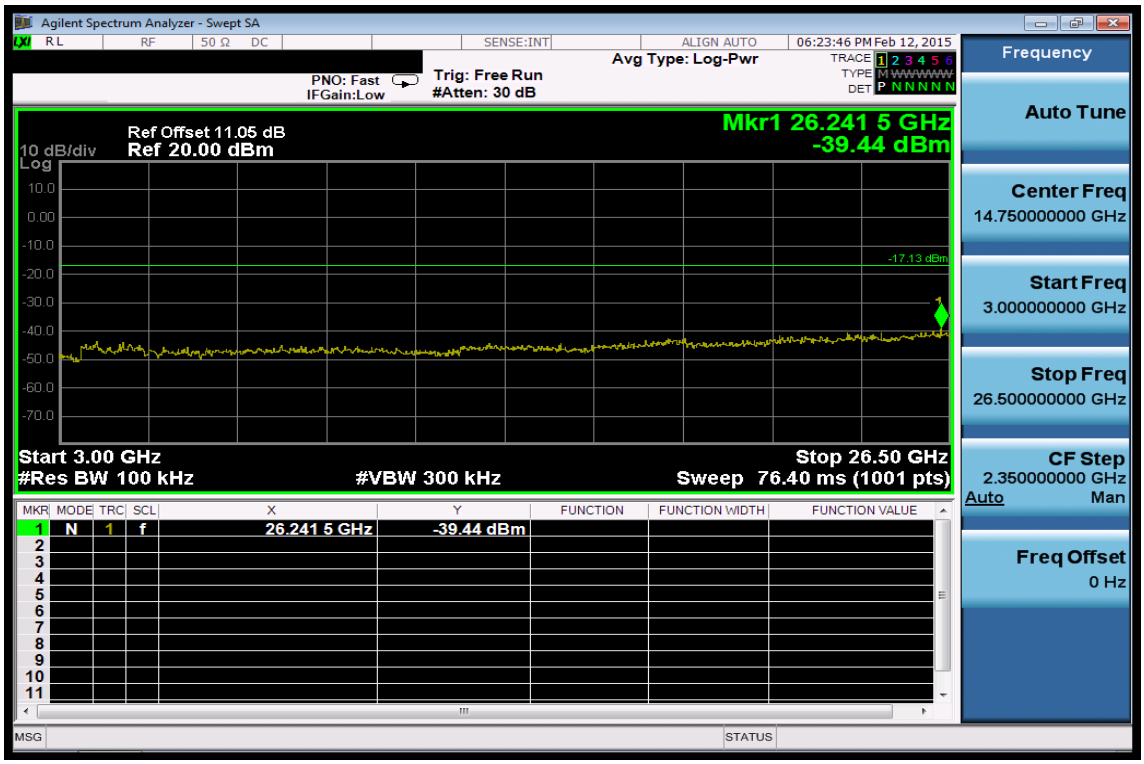
Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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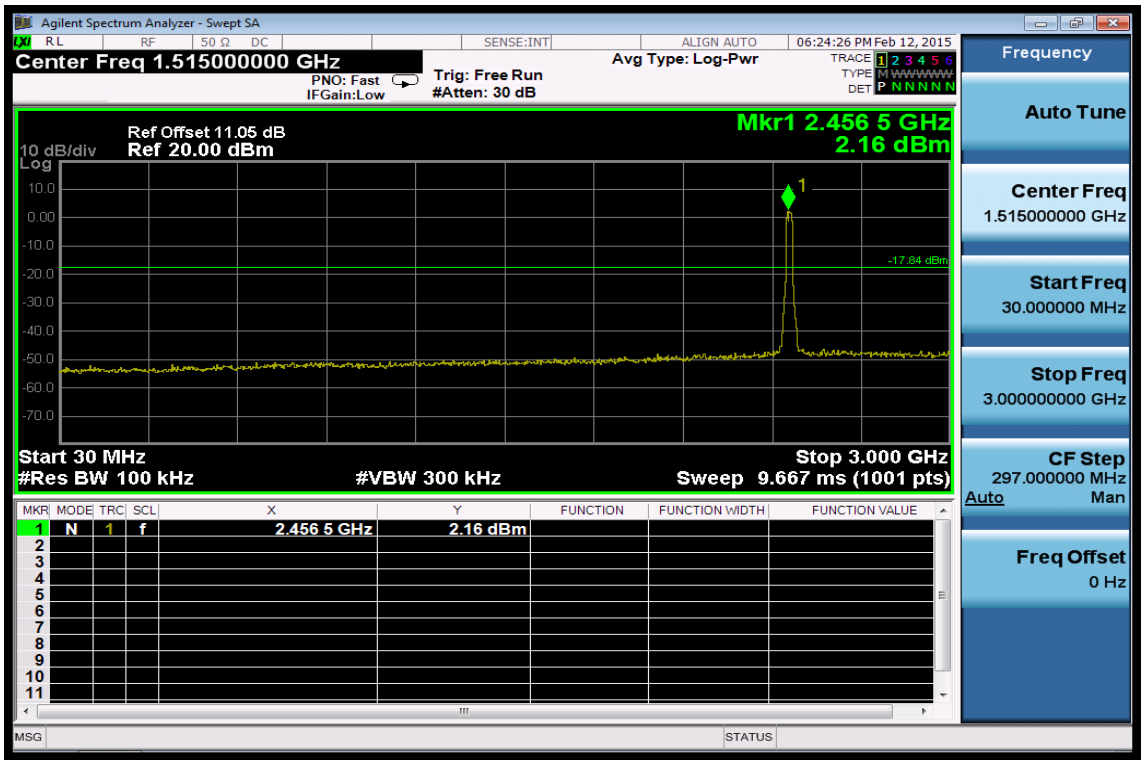
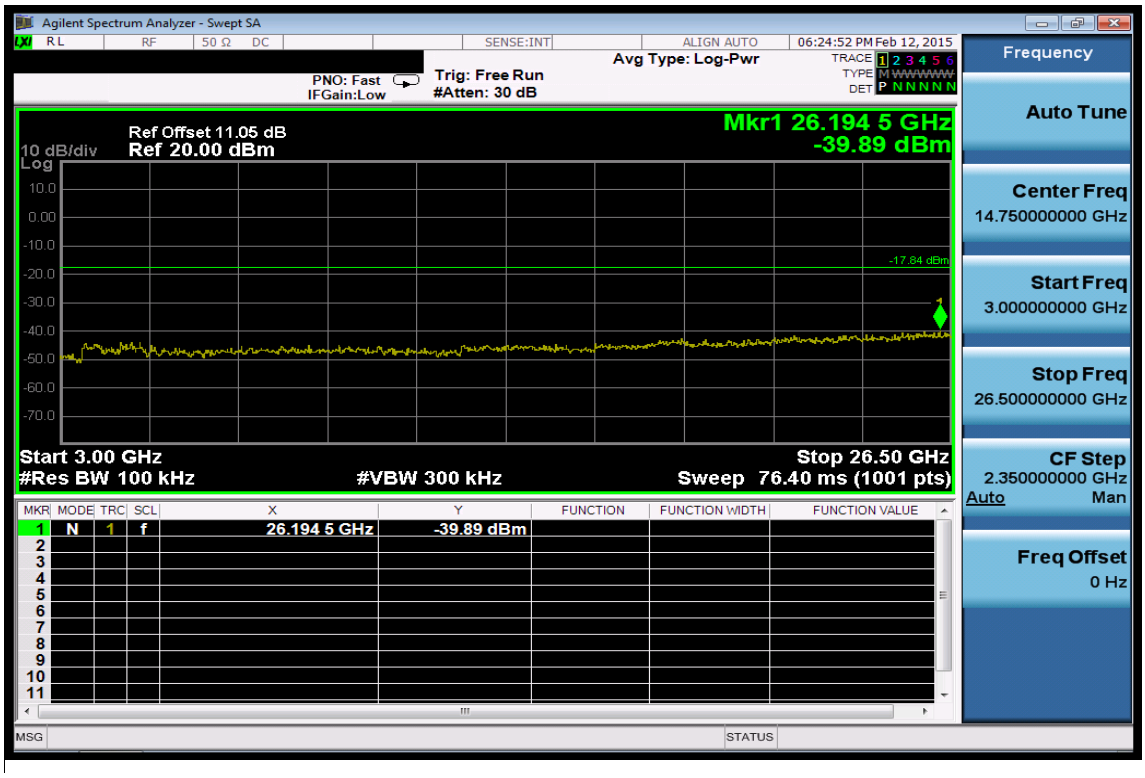
Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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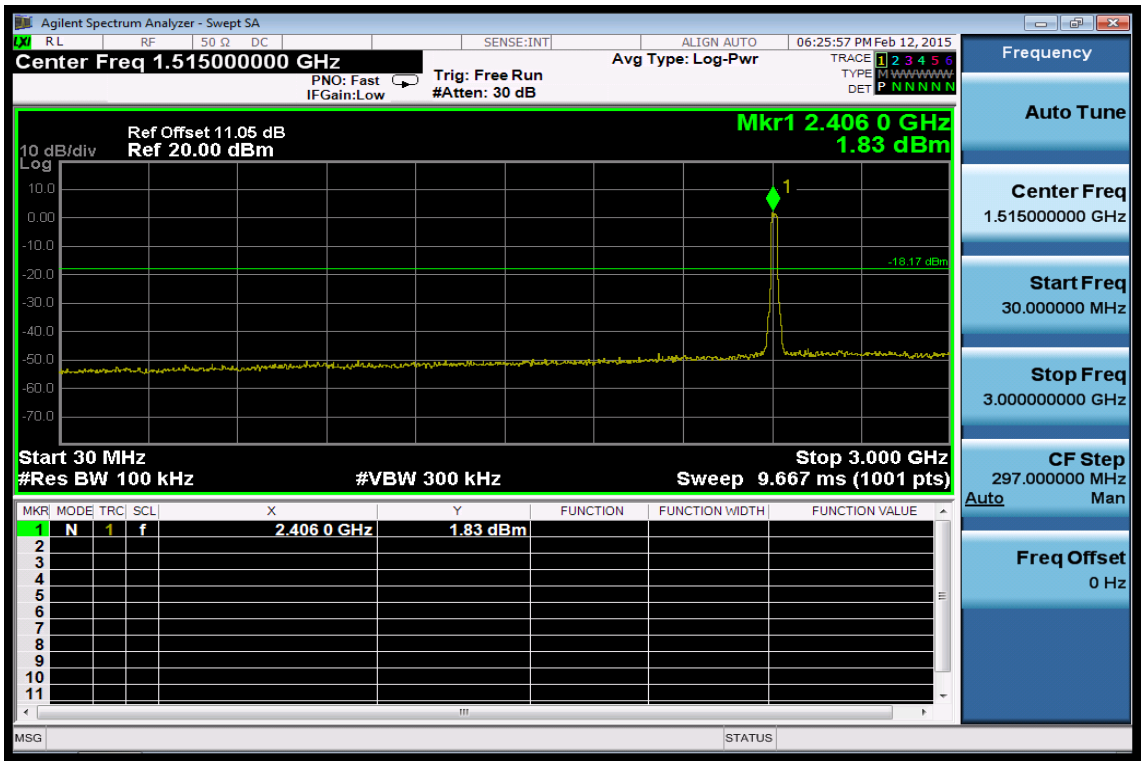
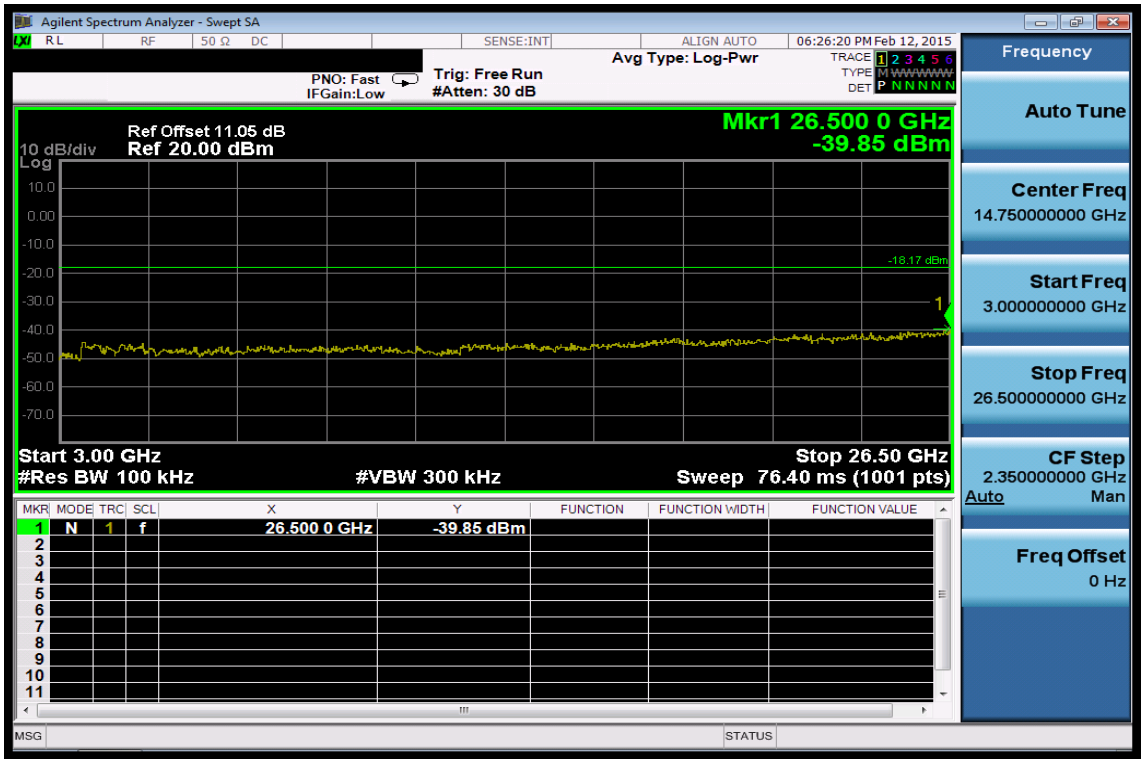
Conducted Spurious Emission Measurement Result (802.11n_20M)

Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz



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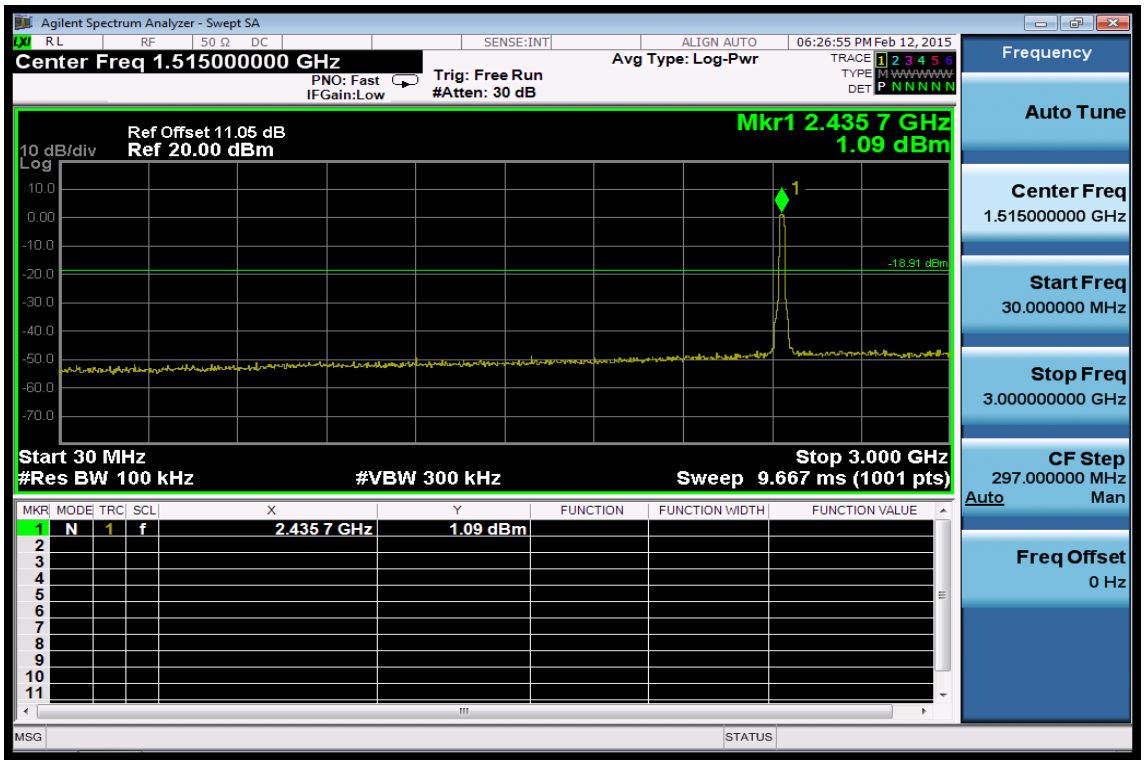
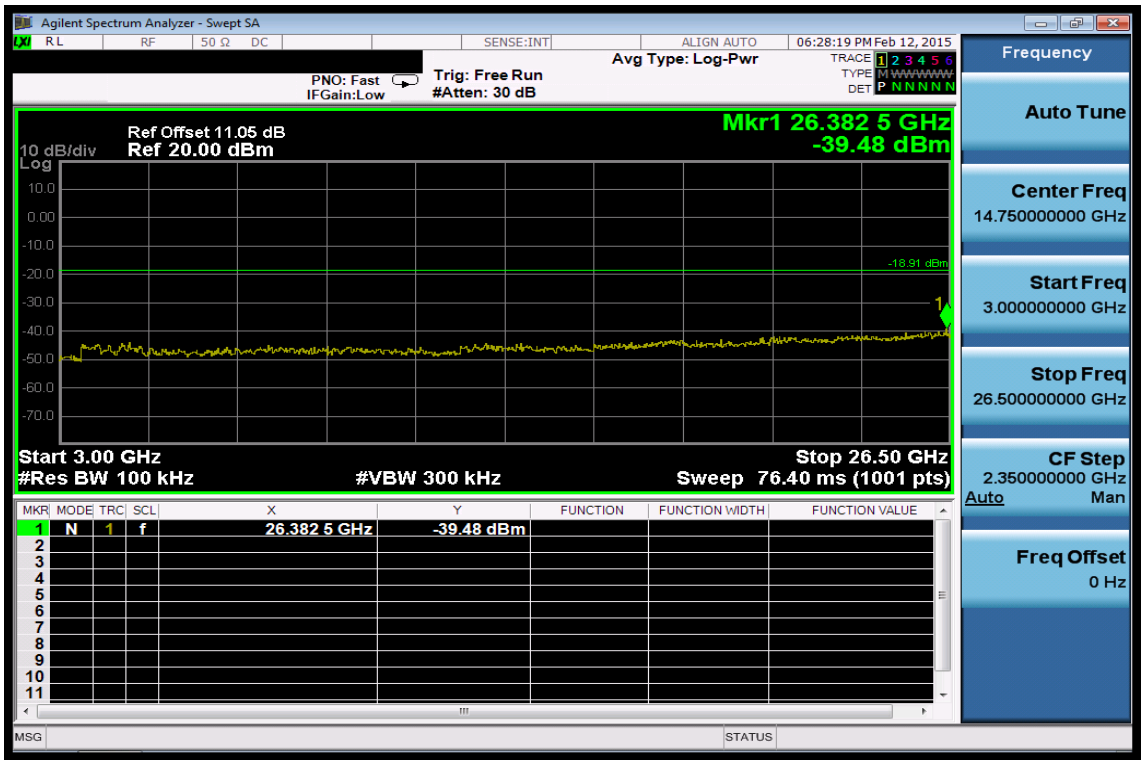
Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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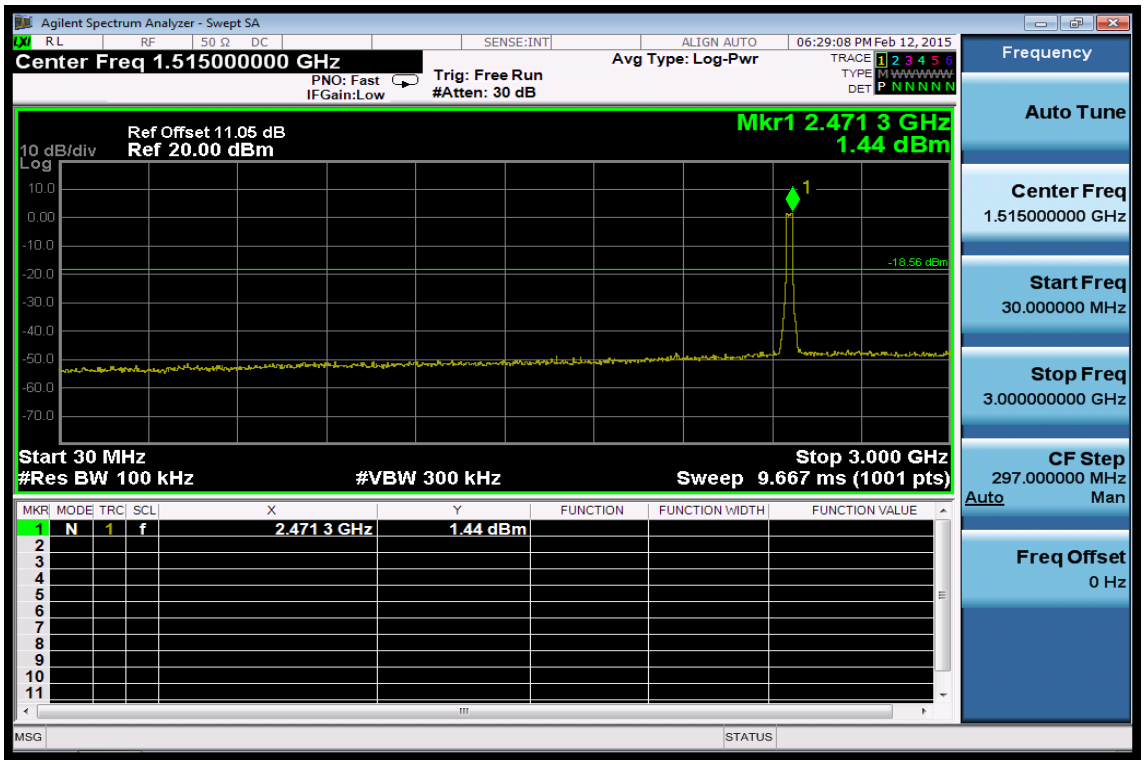
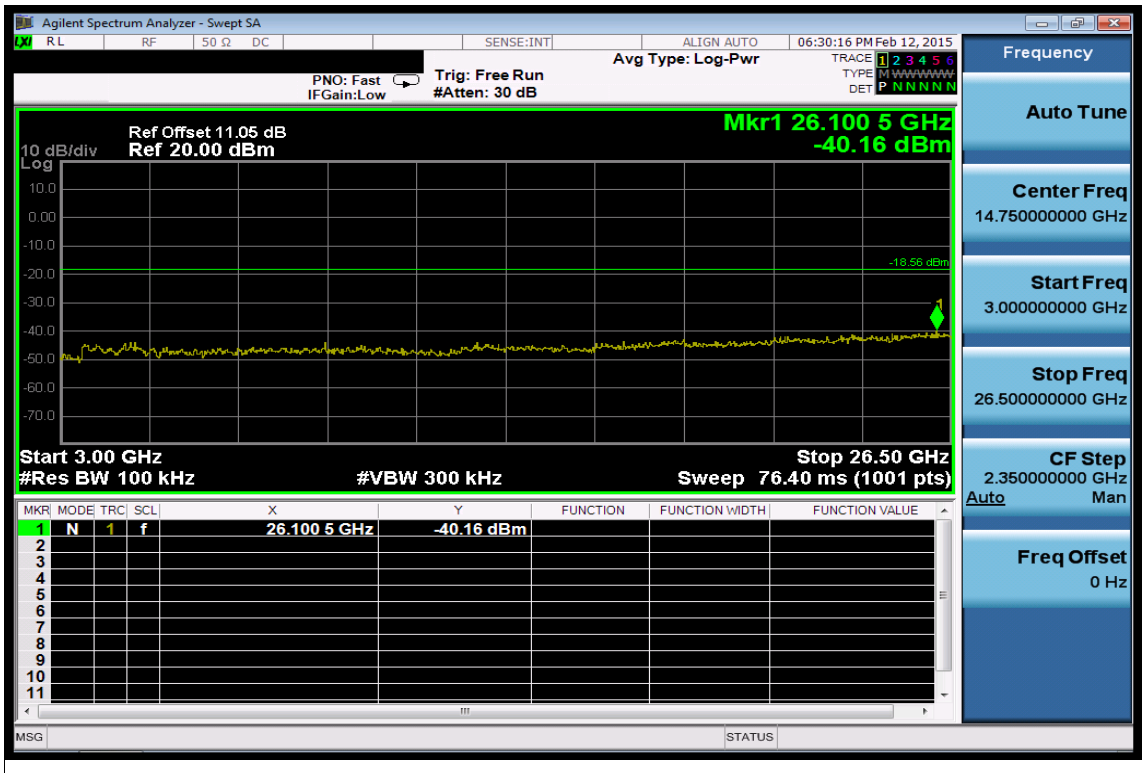
Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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Radiated Spurious Emission Measurement Result (802.11b)

Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
32.91	S	Peak	39.55	-14.69	24.86	40.00	-15.14
101.78	S	Peak	52.66	-23.54	29.12	43.50	-14.38
445.16	S	Peak	42.42	-15.18	27.24	46.00	-18.76
720.64	S	Peak	35.33	-10.77	24.56	46.00	-21.44
768.17	S	Peak	35.42	-10.10	25.32	46.00	-20.68
937.92	S	Peak	34.25	-7.62	26.63	46.00	-19.37
4824.00	H	Peak	38.79	10.97	49.76	74.00	-24.24
4824.00	H	Average	26.42	10.97	37.39	54.00	-16.61
7236.00	H	Peak	47.15	15.28	62.43	74.00	-11.57
7236.00	H	Average	29.18	15.28	44.46	54.00	-9.54
9648.00	H	Peak	---				
12060.00	H	Peak	---				
14472.00	H	Peak	---				
16884.00	H	Peak	---				
19296.00	H	Peak	---				
21708.00	H	Peak	---				
24120.00	H	Peak	---				

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Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
101.78	S	Peak	52.32	-23.54	28.77	43.50	-14.73
145.43	S	Peak	62.36	-22.29	40.07	43.50	-3.43
352.04	S	Peak	42.64	-17.31	25.32	46.00	-20.68
445.16	S	Peak	42.45	-15.18	27.27	46.00	-18.73
576.11	S	Peak	40.27	-12.45	27.81	46.00	-18.19
720.64	S	Peak	38.97	-10.77	28.19	46.00	-17.81
4824.00	H	Peak	37.57	10.97	48.54	74.00	-25.46
4824.00	H	Average	27.13	10.97	38.10	54.00	-15.90
7236.00	H	Peak	41.57	15.28	56.86	74.00	-17.14
7236.00	H	Average	30.30	15.28	45.58	54.00	-8.42
9648.00	H	Peak	---				
12060.00	H	Peak	---				
14472.00	H	Peak	---				
16884.00	H	Peak	---				
19296.00	H	Peak	---				
21708.00	H	Peak	---				
24120.00	H	Peak	---				

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Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2437 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
36.79	S	Peak	48.00	-16.96	31.04	40.00	-8.96
71.71	S	Peak	51.64	-27.63	24.02	40.00	-15.99
101.78	S	Peak	50.99	-23.54	27.45	43.50	-16.05
352.04	S	Peak	41.66	-17.31	24.35	46.00	-21.65
445.16	S	Peak	41.10	-15.18	25.92	46.00	-20.08
551.86	S	Peak	36.90	-13.23	23.67	46.00	-22.33
4874.00	H	Peak	38.46	10.89	49.35	74.00	-24.65
4874.00	H	Average	26.70	10.89	37.59	54.00	-16.41
7311.00	H	Peak	48.85	15.31	64.16	74.00	-9.84
7311.00	H	Average	37.62	15.31	52.93	54.00	-1.07
9748.00	H	Peak	---				
12185.00	H	Peak	---				
14622.00	H	Peak	---				
17059.00	H	Peak	---				
19496.00	H	Peak	---				
21933.00	H	Peak	---				
24370.00	H	Peak	---				

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Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2437 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
61.04	S	Peak	57.61	-28.42	29.19	40.00	-10.81
101.78	S	Peak	51.87	-23.54	28.32	43.50	-15.18
167.74	S	Peak	51.21	-23.65	27.55	43.50	-15.95
445.16	S	Peak	42.58	-15.18	27.40	46.00	-18.60
647.89	S	Peak	40.63	-11.08	29.56	46.00	-16.44
720.64	S	Peak	38.87	-10.77	28.10	46.00	-17.90
4874.00	H	Peak	38.39	10.89	49.28	74.00	-24.72
4874.00	H	Average	27.15	10.89	38.04	54.00	-15.96
7311.00	H	Peak	42.22	15.31	57.53	74.00	-16.47
7311.00	H	Average	29.90	15.31	45.21	54.00	-8.79
9748.00	H	Peak	---				
12185.00	H	Peak	---				
14622.00	H	Peak	---				
17059.00	H	Peak	---				
19496.00	H	Peak	---				
21933.00	H	Peak	---				
24370.00	H	Peak	---				

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Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	S	Peak	52.82	-27.63	25.19	40.00	-14.81
101.78	S	Peak	52.92	-23.54	29.38	43.50	-14.12
167.74	S	Peak	45.38	-23.65	21.72	43.50	-21.78
352.04	S	Peak	41.77	-17.31	24.46	46.00	-21.54
445.16	S	Peak	40.21	-15.18	25.03	46.00	-20.97
528.58	S	Peak	37.46	-13.16	24.29	46.00	-21.71
768.17	S	Peak	36.45	-10.10	26.35	46.00	-19.65
4924.00	H	Peak	38.37	10.98	49.34	74.00	-24.66
4924.00	H	Average	27.05	10.98	38.03	54.00	-15.97
7386.00	H	Peak	47.08	15.51	62.58	74.00	-11.42
7386.00	H	Average	36.15	15.51	51.66	54.00	-2.34
9848.00	H	Peak	---				
12310.00	H	Peak	---				
14772.00	H	Peak	---				
17234.00	H	Peak	---				
19696.00	H	Peak	---				
22158.00	H	Peak	---				
24620.00	H	Peak	---				

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Operation Band	:802.11 b	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
101.78	S	Peak	53.38	-23.54	29.84	43.50	-13.66
169.68	S	Peak	51.16	-23.70	27.46	43.50	-16.04
445.16	S	Peak	42.73	-15.18	27.55	46.00	-18.45
528.58	S	Peak	39.80	-13.16	26.64	46.00	-19.36
647.89	S	Peak	39.59	-11.08	28.51	46.00	-17.49
720.64	S	Peak	38.97	-10.77	28.20	46.00	-17.80
4924.00	H	Peak	39.00	10.98	49.98	74.00	-24.02
4924.00	H	Average	25.55	10.98	36.53	54.00	-17.47
7386.00	H	Peak	41.83	15.51	57.34	74.00	-16.66
7386.00	H	Average	30.28	15.51	45.79	54.00	-8.21
9848.00	H	Peak	---				
12310.00	H	Peak	---				
14772.00	H	Peak	---				
17234.00	H	Peak	---				
19696.00	H	Peak	---				
22158.00	H	Peak	---				
24620.00	H	Peak	---				

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Radiated Spurious Emission Measurement Result (802.11g)

Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
63.95	S	Peak	61.03	-28.21	32.82	40.00	-7.18
106.63	S	Peak	60.04	-22.83	37.22	43.50	-6.28
122.15	S	Peak	58.75	-21.40	37.35	43.50	-6.15
158.04	S	Peak	48.84	-23.05	25.79	43.50	-17.71
352.04	S	Peak	42.50	-17.31	25.18	46.00	-20.82
503.36	S	Peak	39.39	-14.15	25.25	46.00	-20.75
4824.00	H	Peak	38.19	10.97	49.16	74.00	-24.84
4824.00	H	Average	26.12	10.97	37.09	54.00	-16.91
7236.00	H	Peak	43.35	15.32	58.67	74.00	-15.33
7236.00	H	Average	29.80	15.32	45.12	54.00	-8.88
9648.00	H	Peak	---				
12060.00	H	Peak	---				
14472.00	H	Peak	---				
16884.00	H	Peak	---				
19296.00	H	Peak	---				
21708.00	H	Peak	---				
24120.00	H	Peak	---				

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Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
101.78	S	Peak	50.06	-23.54	26.52	43.50	-16.98
167.74	S	Peak	51.49	-23.65	27.84	43.50	-15.66
445.16	S	Peak	42.10	-15.18	26.91	46.00	-19.09
528.58	S	Peak	40.33	-13.16	27.17	46.00	-18.83
624.61	S	Peak	39.45	-12.15	27.30	46.00	-18.70
696.39	S	Peak	38.63	-11.04	27.59	46.00	-18.41
4824.00	H	Peak	37.60	10.97	48.57	74.00	-25.43
4824.00	H	Average	29.10	10.97	40.07	54.00	-13.93
7236.00	H	Peak	---				
9648.00	H	Peak	---				
12060.00	H	Peak	---				
14472.00	H	Peak	---				
16884.00	H	Peak	---				
19296.00	H	Peak	---				
21708.00	H	Peak	---				
24120.00	H	Peak	---				

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Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2437 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
64.92	S	Peak	57.53	-28.16	29.37	40.00	-10.63
101.78	S	Peak	51.82	-23.54	28.28	43.50	-15.22
269.59	S	Peak	49.33	-19.68	29.65	46.00	-16.35
345.25	S	Peak	42.79	-17.54	25.26	46.00	-20.74
445.16	S	Peak	40.21	-15.18	25.03	46.00	-20.97
528.58	S	Peak	37.57	-13.16	24.40	46.00	-21.60
4874.00	H	Peak	37.45	10.89	48.34	74.00	-25.66
4874.00	H	Average	26.83	10.89	37.72	54.00	-16.28
7311.00	H	Peak	46.04	15.31	61.34	74.00	-12.66
7311.00	H	Average	31.30	15.31	46.61	54.00	-7.39
9748.00	H	Peak	---				
12185.00	H	Peak	---				
14622.00	H	Peak	---				
17059.00	H	Peak	---				
19496.00	H	Peak	---				
21933.00	H	Peak	---				
24370.00	H	Peak	---				

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Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2437 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
63.95	S	Peak	58.03	-28.21	29.82	40.00	-10.18
100.81	S	Peak	53.03	-23.69	29.34	43.50	-14.16
173.56	S	Peak	51.44	-23.99	27.45	43.50	-16.05
528.58	S	Peak	39.85	-13.16	26.69	46.00	-19.31
672.14	S	Peak	40.22	-11.68	28.54	46.00	-17.46
696.39	S	Peak	38.81	-11.04	27.77	46.00	-18.23
4874.00	H	Peak	37.91	10.89	48.80	74.00	-25.20
4874.00	H	Average	27.30	10.89	38.19	54.00	-15.81
7311.00	H	Peak					
9748.00	H	Peak	---				
12185.00	H	Peak	---				
14622.00	H	Peak	---				
17059.00	H	Peak	---				
19496.00	H	Peak	---				
21933.00	H	Peak	---				
24370.00	H	Peak	---				

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Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
32.91	S	Peak	39.84	-14.69	25.15	40.00	-14.85
71.71	S	Peak	52.01	-27.63	24.38	40.00	-15.62
101.78	S	Peak	51.50	-23.54	27.96	43.50	-15.54
503.36	S	Peak	38.64	-14.15	24.49	46.00	-21.51
600.36	S	Peak	36.09	-12.45	23.64	46.00	-22.36
768.17	S	Peak	36.05	-10.10	25.94	46.00	-20.06
4924.00	H	Peak	38.04	10.98	49.02	74.00	-24.98
4924.00	H	Average	26.73	10.98	37.71	54.00	-16.29
7386.00	H	Average	29.78	15.57	45.35	54.00	-8.65
7386.00	H	Peak	42.90	15.57	58.47	74.00	-15.53
9848.00	H	Peak	---				
12310.00	H	Peak	---				
14772.00	H	Peak	---				
17234.00	H	Peak	---				
19696.00	H	Peak	---				
22158.00	H	Peak	---				
24620.00	H	Peak	---				

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Operation Band	:802.11 g	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
35.82	S	Peak	45.14	-16.34	28.80	40.00	-11.20
99.84	S	Peak	52.29	-23.84	28.46	43.50	-15.04
528.58	S	Peak	39.69	-13.16	26.53	46.00	-19.47
600.36	S	Peak	38.89	-12.45	26.44	46.00	-19.56
672.14	S	Peak	39.36	-11.68	27.68	46.00	-18.32
720.64	S	Peak	38.18	-10.77	27.41	46.00	-18.59
4924.00	H	Peak	37.05	10.98	48.02	74.00	-25.98
4924.00	H	Average	26.53	10.98	37.51	54.00	-16.49
7386.00	H	Peak	---				
9848.00	H	Peak	---				
12310.00	H	Peak	---				
14772.00	H	Peak	---				
17234.00	H	Peak	---				
19696.00	H	Peak	---				
22158.00	H	Peak	---				
24620.00	H	Peak	---				

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Radiated Spurious Emission Measurement Result (802.11n_20M)

Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
32.91	S	Peak	39.24	-14.69	24.54	40.00	-15.46
99.84	S	Peak	49.26	-23.84	25.42	43.50	-18.08
251.16	S	Peak	42.46	-20.34	22.12	46.00	-23.88
528.58	S	Peak	38.42	-13.16	25.26	46.00	-20.74
768.17	S	Peak	35.26	-10.10	25.16	46.00	-20.84
938.89	S	Peak	34.60	-7.63	26.97	46.00	-19.03
4824.00	H	Peak	37.23	10.97	48.20	74.00	-25.80
4824.00	H	Average	26.50	10.97	37.47	54.00	-16.53
7236.00	H	Peak	43.64	15.28	58.93	74.00	-15.07
7236.00	H	Average	28.18	15.28	43.46	54.00	-10.54
9648.00	H	Peak	---				
12060.00	H	Peak	---				
14472.00	H	Peak	---				
16884.00	H	Peak	---				
19296.00	H	Peak	---				
21708.00	H	Peak	---				
24120.00	H	Peak	---				

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Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2412 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
34.85	S	Peak	46.58	-15.75	30.83	40.00	-9.17
99.84	S	Peak	52.62	-23.84	28.78	43.50	-14.72
169.68	S	Peak	50.90	-23.70	27.20	43.50	-16.30
528.58	S	Peak	40.00	-13.16	26.84	46.00	-19.16
647.89	S	Peak	38.85	-11.08	27.78	46.00	-18.22
696.39	S	Peak	38.78	-11.04	27.75	46.00	-18.25
4824.00	H	Peak	38.01	10.97	48.98	74.00	-25.02
4824.00	H	Average	26.30	10.97	37.27	54.00	-16.73
7236.00	H	Peak	---				
9648.00	H	Peak	---				
12060.00	H	Peak	---				
14472.00	H	Peak	---				
16884.00	H	Peak	---				
19296.00	H	Peak	---				
21708.00	H	Peak	---				
24120.00	H	Peak	---				

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Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2437 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
60.07	S	Peak	57.72	-28.50	29.22	40.00	-10.78
100.81	S	Peak	48.88	-23.69	25.19	43.50	-18.31
151.25	S	Peak	47.55	-22.79	24.76	43.50	-18.74
352.04	S	Peak	40.65	-17.31	23.34	46.00	-22.66
445.16	S	Peak	42.00	-15.18	26.82	46.00	-19.18
528.58	S	Peak	37.87	-13.16	24.71	46.00	-21.29
4874.00	H	Peak	38.10	10.89	48.99	74.00	-25.01
4874.00	H	Average	26.23	10.89	37.12	54.00	-16.88
7311.00	H	Peak	42.75	15.41	58.15	74.00	-15.85
7311.00	H	Average	28.83	15.41	44.24	54.00	-9.76
9748.00	H	Peak	---				
12185.00	H	Peak	---				
14622.00	H	Peak	---				
17059.00	H	Peak	---				
19496.00	H	Peak	---				
21933.00	H	Peak	---				

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Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2437 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
63.95	S	Peak	53.76	-28.21	25.54	40.00	-14.46
167.74	S	Peak	49.71	-23.65	26.05	43.50	-17.45
445.16	S	Peak	43.50	-15.18	28.32	46.00	-17.68
528.58	S	Peak	39.96	-13.16	26.80	46.00	-19.20
576.11	S	Peak	38.40	-12.45	25.95	46.00	-20.05
720.64	S	Peak	39.22	-10.77	28.44	46.00	-17.56
4874.00	H	Peak	37.87	10.89	48.76	74.00	-25.24
4874.00	H	Average	26.80	10.89	37.69	54.00	-16.31
7311.00	H	Peak	---				
9748.00	H	Peak	---				
12185.00	H	Peak	---				
14622.00	H	Peak	---				
17059.00	H	Peak	---				
19496.00	H	Peak	---				
21933.00	H	Peak	---				
24370.00	H	Peak	---				

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Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
34.85	S	Peak	44.55	-15.75	28.79	40.00	-11.21
71.71	S	Peak	52.02	-27.63	24.39	40.00	-15.61
101.78	S	Peak	49.72	-23.54	26.18	43.50	-17.32
528.58	S	Peak	38.60	-13.16	25.44	46.00	-20.56
600.36	S	Peak	37.44	-12.45	24.99	46.00	-21.01
720.64	S	Peak	35.06	-10.77	24.29	46.00	-21.71
4924.00	H	Peak	37.20	10.98	48.18	74.00	-25.82
4924.00	H	Average	26.80	10.98	37.78	54.00	-16.22
7386.00	H	Peak	---				
9848.00	H	Peak	---				
12310.00	H	Peak	---				
14772.00	H	Peak	---				
17234.00	H	Peak	---				
19696.00	H	Peak	---				
22158.00	H	Peak	---				
24620.00	H	Peak	---				

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Operation Band	:802.11 n20M	Test Date	:2015-02-17
Fundamental Frequency	:2462 MHz	Temp./Humi.	:18.5 deg_C / 57 RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
100.81	S	Peak	50.46	-23.69	26.77	43.50	-16.73
167.74	S	Peak	49.38	-23.65	25.73	43.50	-17.77
445.16	S	Peak	43.07	-15.18	27.89	46.00	-18.11
528.58	S	Peak	39.73	-13.16	26.57	46.00	-19.43
647.89	S	Peak	38.82	-11.08	27.74	46.00	-18.26
720.64	S	Peak	38.94	-10.77	28.16	46.00	-17.84
4924.00	H	Peak	38.11	10.98	49.08	74.00	-24.92
4924.00	H	Average	26.10	10.98	37.08	54.00	-16.92
7386.00	H	Peak	---				
9848.00	H	Peak	---				
12310.00	H	Peak	---				
14772.00	H	Peak	---				
17234.00	H	Peak	---				
19696.00	H	Peak	---				
22158.00	H	Peak	---				
24620.00	H	Peak	---				

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11 PEAK POWER SPECTRAL DENSITY

11.1 Standard Applicable:

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

11.2 Measurement Equipment Used:

Refer to section 7.2 for details.

11.3 Test Set-up:

Refer to section 7.3 for details. (Spectrum Option)

11.4 Measurement Procedure (following the measurement procedure 10.2 of KDB558074):

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW ≥ 3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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11.5 Measurement Result:

802.11b

MHz	Reading (dBm)	(dBm)
2412	-4.360	8
2437	-4.520	8
2462	-5.780	8

802.11g

Frequency MHz	RF Power Density Reading (dBm)	Maximum Limit (dBm)
2412	-10.680	8
2437	-10.220	8
2462	-11.480	8

802.11n_20M

MHz	Reading (dBm)	(dBm)
2412	-11.485	8
2437	-11.500	8
2462	-11.260	8

** Note: Offset 11.05dB for 2.4G 802.11b/g/n_20*

**Refer to next page for plots*

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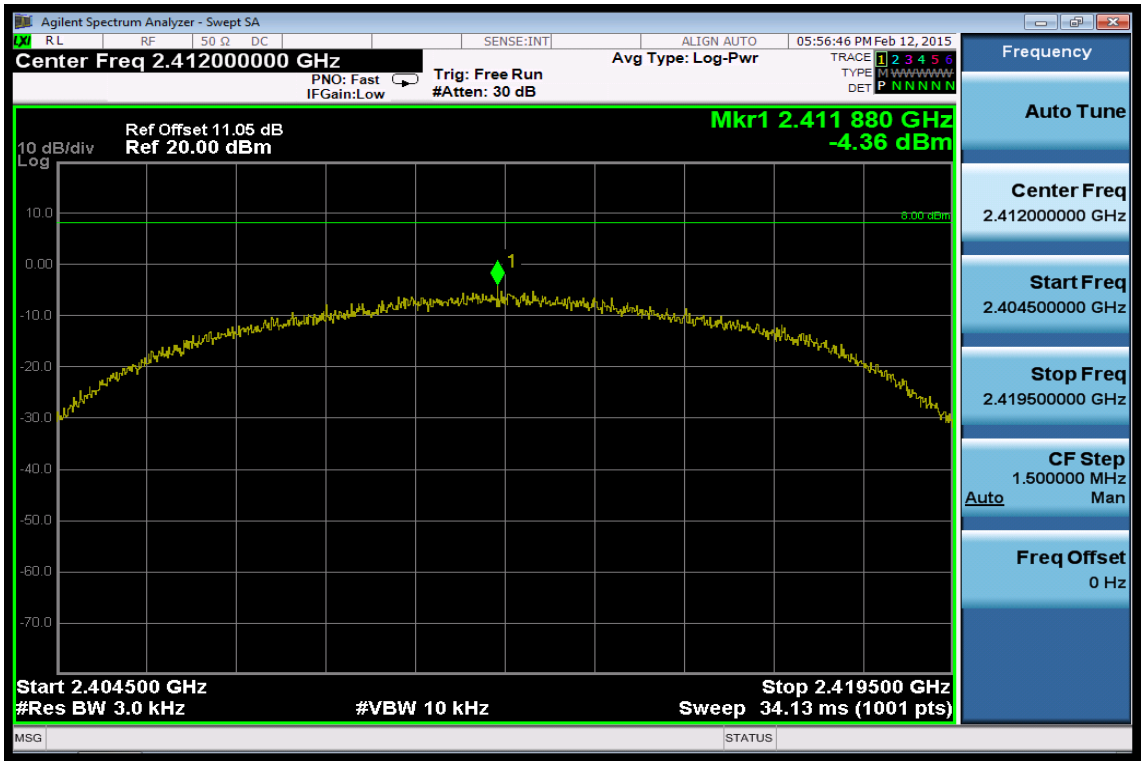
802.11b

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)

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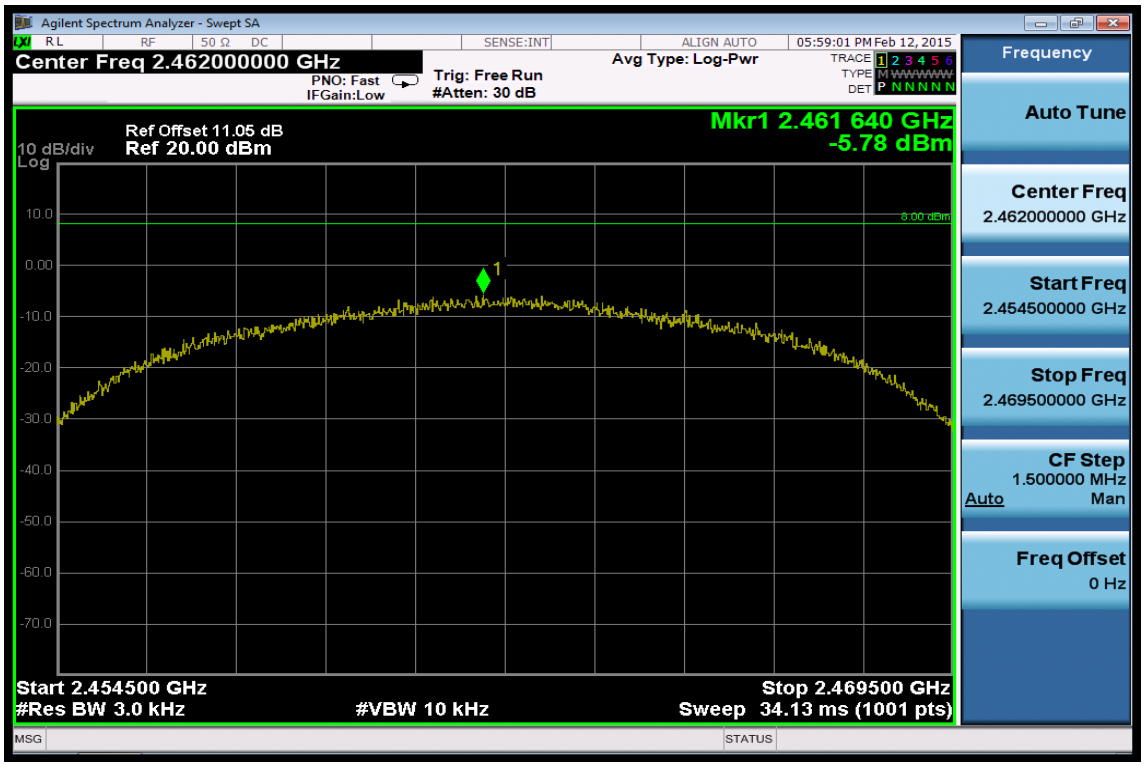
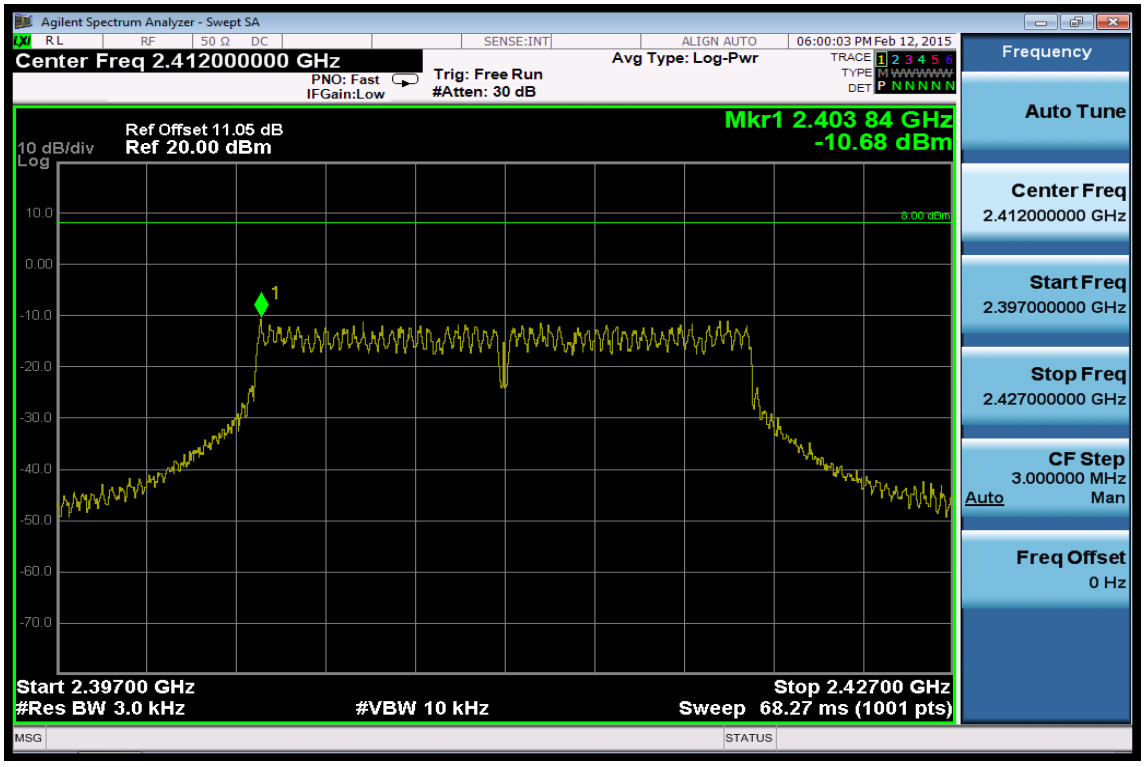
Power Spectral Density Test Plot (CH-High)



802.11g

Power Spectral Density Test Plot (CH-Low)



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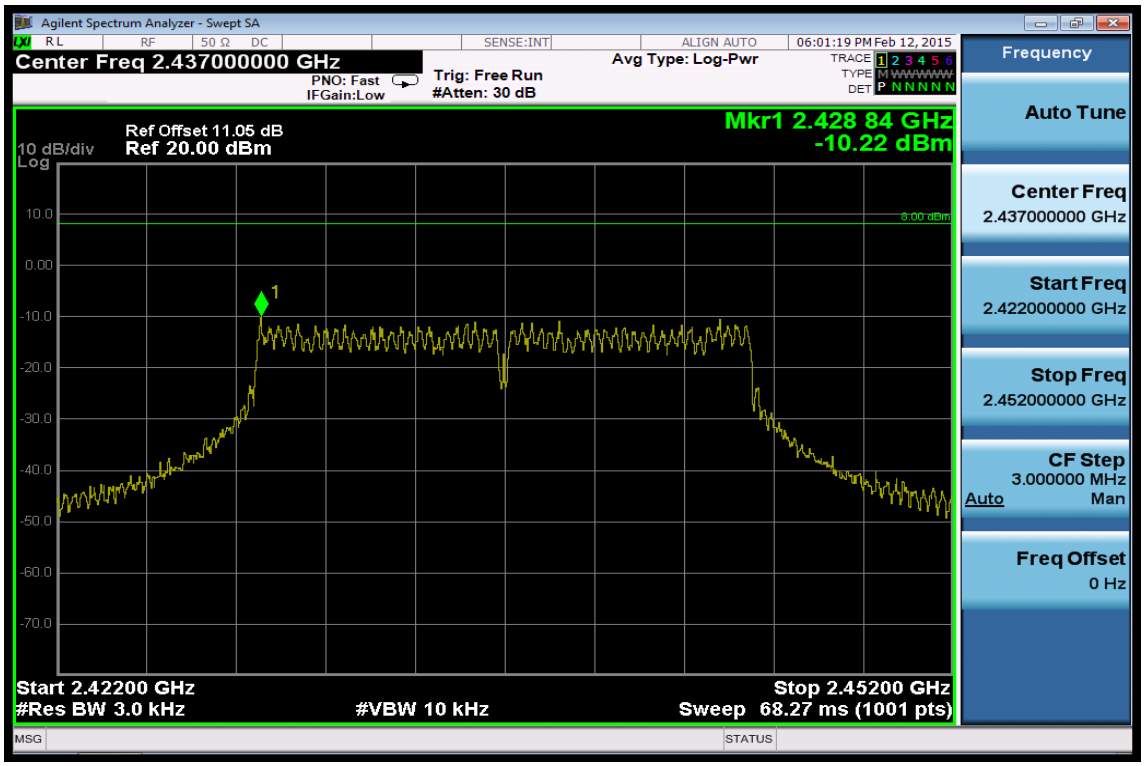
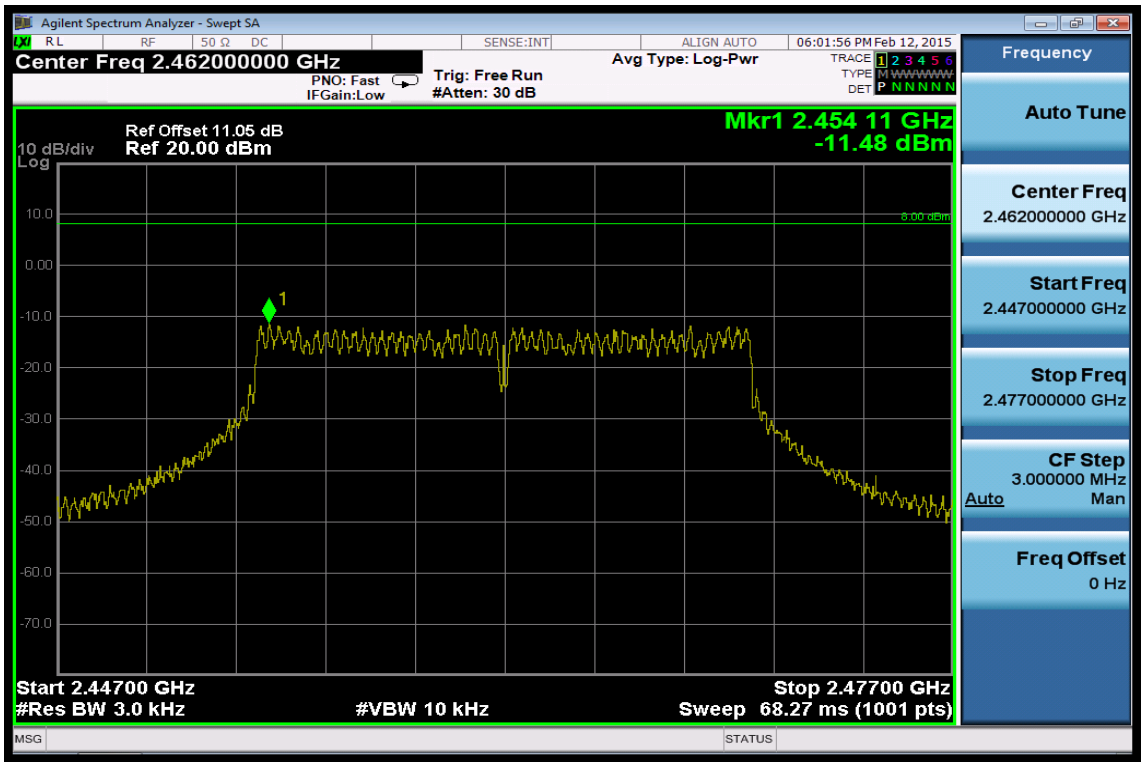
Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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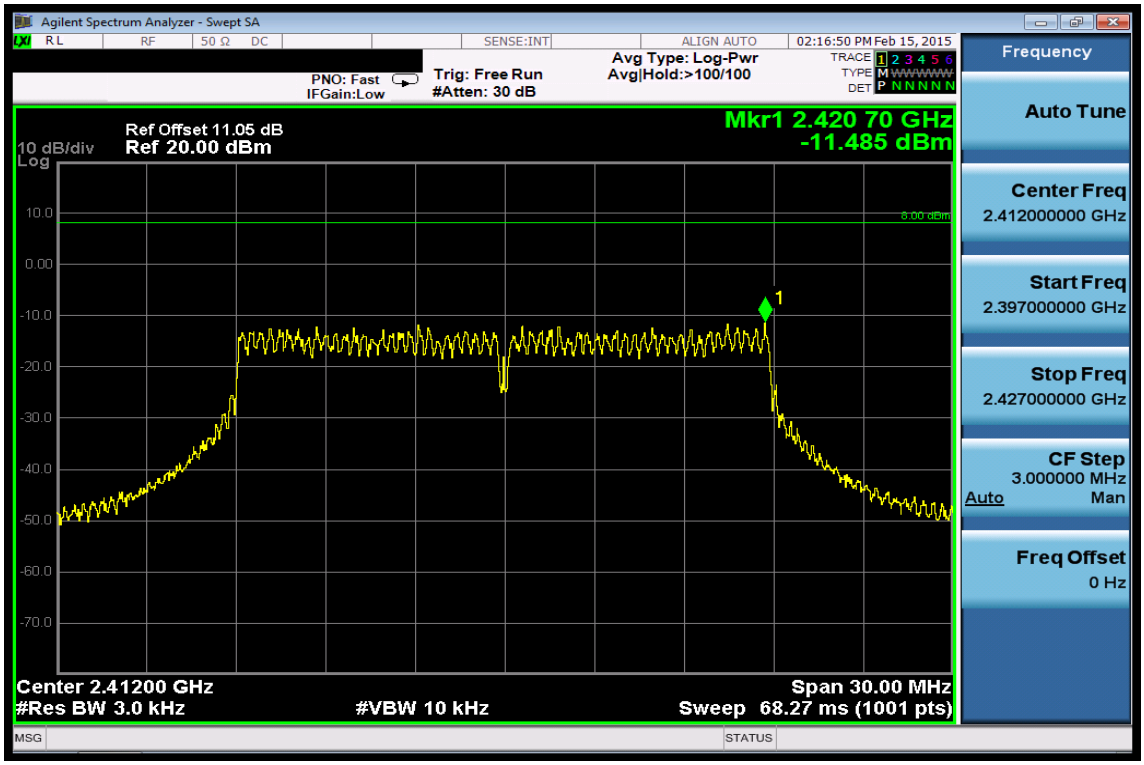
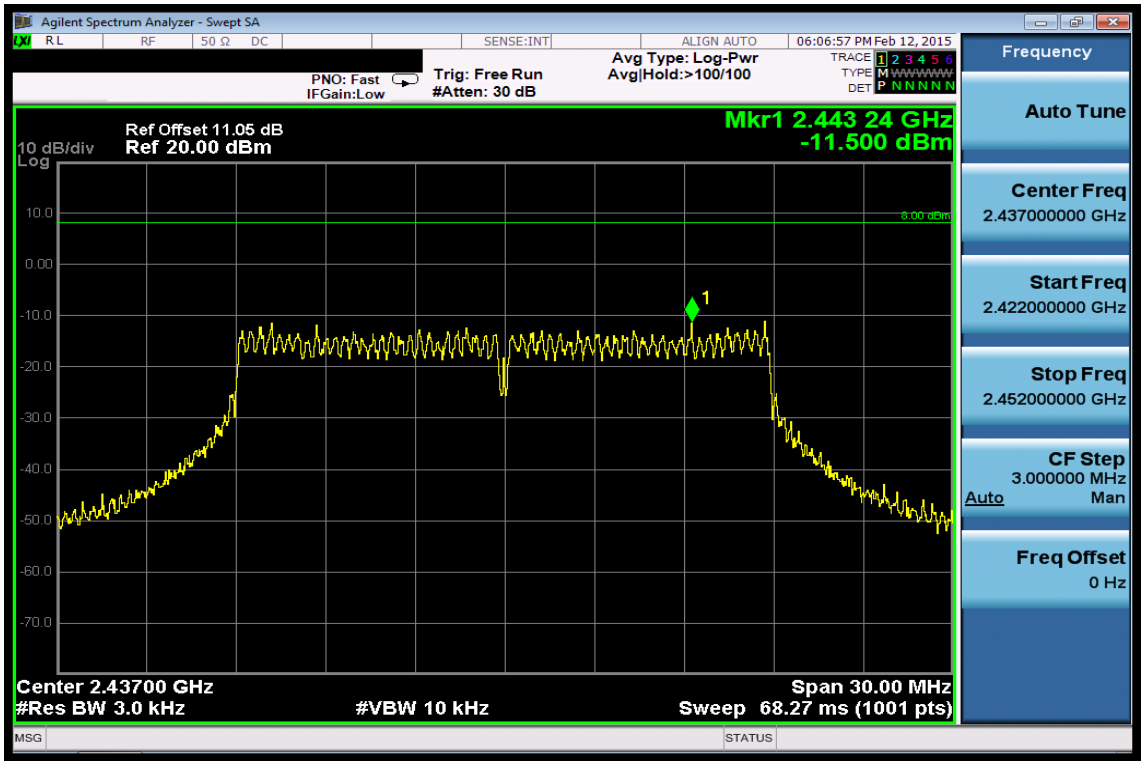
802.11n_20M

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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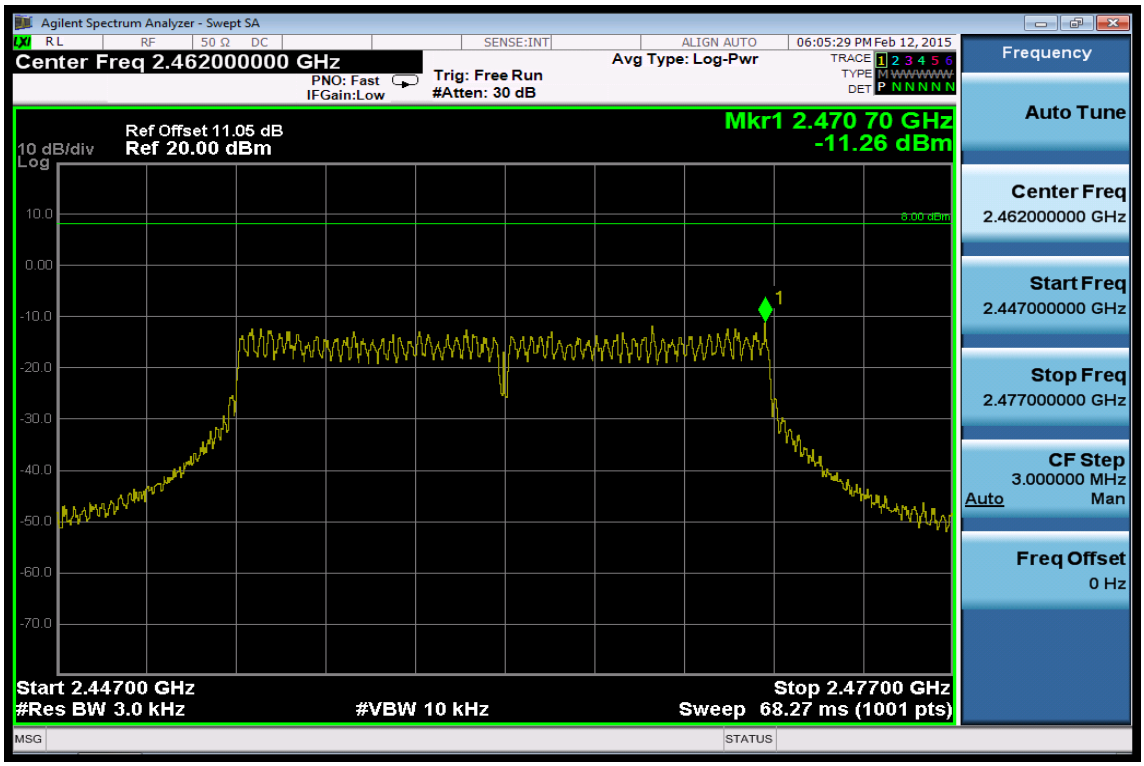
Power Spectral Density Test Plot (CH-High)



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12 ANTENNA REQUIREMENT

12.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

12.2 Antenna Connected Construction:

The directional gains of antenna used for transmitting is 0.76dBi. In addition, the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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